EMD Operating Procedures

Manual No. 5-21000-OPS-AP

Volume VI:

Air

EG&G ROCKY FLATS

REVIEWED FOR CLASSIFICATION/UCNI
By K L Dalton (UNID)
Date 11/7/91

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EMD Operating Procedures

Manual No. 5-21000-OPS-AP

Volume VI:

Air

EG&G ROCKY FLATS

THIS IS ONE VOLUME OF A SIX VOLUME SET WHICH INCLUDES:

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	Effective Date:	
Category 2	**Organization: Environmental Management**	

Title:
EFFLUENT TRITIUM SAMPLE COLLECTION

Approved By:

Director, EMD — 10/4/91 Date

CONTROLLED DOCUMENT
EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT
This Stamp

1.0 Purpose

This procedure establishes steps for sampling tritium in effluent air originating from areas whose processes involve materials containing or having the potential for tritium contamination. (See Attachment 1 for a list of the location numbers).

2.0 Scope

This procedure applies to the requirements for exchanging tritium sample bottles from effluent exhaust sampling systems and addresses (1) tritium sample bottle preparation, (2) tritium sample bottle collection, and (3) sample disposition. This sampling activity addresses the locations specified in Attachment 1.

3.0 References

3.1 Source References

1. EG&G. Health and Safety Practices Manual. Rocky Flats Plant, Health and Safety.

2. EG&G. Radiological Operating Instructions. Rocky Flats Plant.

3. EMD, "Quality Assurance Program Document," Environmental Department, (21000-QAPD).

3.2 Internal References

1. EG&G, Health and Safety Program Plan. Rocky Flats Plant, Environmental Restoration. October 26, 1990.

2. HSP 2.04, "Employees Working Alone."

3. HSP 18.02 "Personnel Contamination Control Requirements for Radiologically Controlled Areas."

4. HSP 18.08, "Use of Step-Off Pads and H&S Barrier Areas in Radiologically Controlled Areas."

5. HSP 18.09, ""Self Monitoring - Combo Hand-and-Foot Monitors and Alpha-Mets."

6. HSP 18.12, "Radioactive Contamination and Decontamination."

7. ROI 6.1, "Performance Tests and Operational Checks for Ludlum Model 12-1A and 31 Survey Instruments."

8. 3-21000-ADM-08.01, "Control and Identification of Items, Samples, and Data.

4.0 Prerequisites

4.1 EMAT personnel implementing this procedure shall receive task specific training prior to initiating the task.

4.2 Personnel performing the work described in this procedure shall have received required training and have a current building indoctrination for every building in which the work will be performed.

4.3 AQ&CT Division will specify, in writing, any deviations from the normal collection frequency that may occur during holidays, shutdowns, or other nonroutine periods of operation.

4.4 Obtain equipment and supplies required for the tritium sample collection:

- Ludlum 12-1A
- Prepared tritium sample bottles and carrier
- Six extra tritium sample bottle labels
- Surgeon's gloves
- Respiratory protection
- Respirator card
- Building indoctrination card
- Hazardous waste card
- Exempt badge for PA
- Tritium Travel and Chain of Custody Sheets

5.0 Limitations and Precautions

5.1 Personnel performing this work shall be qualified Environmental Monitoring & Assessment Technologists (EMATs). AQ&CT Division is responsible for the indoctrination and the hands-on environmental training and qualification of EMATs.

5.2 Two employees shall be present when activities in this procedure are completed, if mandated this limitation is by the security requirements per the area or HSP 2.04, "Employees Working Alone." Only one of these employees must be a qualified EMAT.

5.3 Collect tritium effluent samples on Monday, Wednesday, and Friday each week. Special samples may be scheduled at the direction of AQ&CT Division Program Manager.

5.4 AQ&CT Division will specify, in writing, any deviations from the normal collection frequency that may occur during holidays, shutdowns, or other nonroutine periods of operation.

5.5 Assure all activities are implemented in a manner that maintains the chain-of-custody for the sample consistent with 3-21000-ADM-08.01, Control and Identification of Items, Samples, and Data.

6.0 Procedures

WARNING
Follow the H&S Procedures for exiting controlled areas.

6.1 Tritium Sample Bottle Preparation

6.1.1 Go to the Radiological Health Laboratory.

6.1.2 Obtain 12 new tritium sample bottles and bottle caps from storage in Room #109B.

6.1.3 Obtain the bottle (typically 1 gallon) labeled double filtered deionized distilled water from Radiological Health Laboratory. The deionized distilled water bottle should be equipped with a pipette dispenser.

6.1.3.1 If there is no pipette, obtain the assistance of laboratory personnel in obtaining one.

6.1.3.2 If the double filtered deionized distilled water bottle contains more than 1200 ml, go to step 6.1.4.

6.1.3.3 If the bottle is empty or needs to be refilled, obtain the large jug (typically 5 gallons) of deionized distilled water also stored in Room #109B.

6.1.3.4 If this jug is also empty contact Lab personnel for a refill.

6.1.3.5 Remove the pipette dispenser from the deionized distilled water bottle.

6.1.3.6 Fill the bottle (typically 1 gallon) with deionized distilled water from the large jug (see step 6.1.3.3).

6.1.3.7 Reattach the pipette dispenser to the deionized distilled water bottle.

6.1.3.8 Go to Step 6.1.3.2

6.1.4 Place a tritium sample bottle beside the deionized distilled water bottle.

6.1.5 Place the pipette dispenser's discharge tubing into the tritium sample bottle.

6.1.6 Pull up on the pipette dispenser's handle filling the pipette cylinder with 50 ± 5 ml. (one upward movement of the dispenser handle equals 50 ml).

6.1.7 Push down on the pipette dispenser's handle depositing 50 ± 5 ml of deionized water into the tritium sample bottle.

6.1.8 Repeat the two steps above and deposit an additional 50 ± 5 ml into the tritium sample bottle. The sample bottle should now have the required 100 ±10 ml of deionized water.

6.1.9 Remove the dispenser discharge tubing from the filled tritium sample bottle.

6.1.10 Obtain a black tritium sample bottle cap.

6.1.11 Place the cap on the tritium sample bottle ensuring a tight fit. Do not overtighten.

NOTE

Six of the sample bottles are for replacement of tritium overflow bottles, as needed, and may be reused if not used to replace the overflow bottles.

6.1.12 Repeat the steps from placing the pipette dispenser/s discharge tubing into the tritium sample bottle (6.1.5) through placing the cap on the tritium sample

(6.1.11), until six tritium sample bottles have 100 ± 10 ml of deionized distilled water in them.

6.1.13 Complete the tritium sample bottle labels with Building location, date on, and date off, H_2O volume (H_2O volume = .72 x number of days the sample will be on; H_2O volume for two days = 1.44, H_2O volume for three days = 2.16), and collecting personnel's employee number or name for each of the 6 bottles containing deionized distilled water.

6.1.14 Attach one label to each tritium sample bottle.

6.1.15 Place the filled tritium sample and overflow bottles into the tritium sample bottle carrier.

6.2 Tritium Sample Collection

NOTE

A copy of ROI 6.1 is needed to complete the balance of this procedure.

6.2.1 Obtain equipment and supplies.

6.2.2 Source calibrate a Ludlum 12-1A per Radiation Operating Instruction (ROI 6.1).

6.2.3 Verify that you have a respirator card, building indoctrination card, and hazardous waste card, respirator card and exempt badge in your possession to enter the PA. If not follow the instructions provide by your supervisor.

6.2.4 Go to first/next building on the tritium sample route utilizing existing security procedures to access the controlled areas.

6.2.5 Place sample bottles into the security cabinet.

6.2.6 Change into company-furnished clothing per HSP 18.02 as necessary to satisfy clothing requirements.

6.2.7 Remove sample bottles from the security cabinet.

6.2.8 Proceed to first/next sampler location.

6.2.9 Don surgeon's gloves or replace as necessary. This step may be completed prior to this point.

6.2.10 Source check the Ludlum instrument to verify that the instrument is functioning properly (see ROI 6.1).

6.2.11 Locate the tritium sample bottle attached to the tritium sample holder (the bottle on the left side).

CAUTION

Care shall be taken while changing the sample bottles to avoid damaging the fitted dispersion tip or the gasket material.

6.2.12 Unscrew the tritium sample bottle from the tritium sample holder using care to avoid damaging the fitted dispersion tip or the gasket material.

6.2.13 Visually inspect the tritium sampler overflow bottle for liquid.

6.2.13.1 If liquid is present in the tritium sampler overflow bottle (bottle on the right in the tritium sample holder), unscrew overflow bottle from the tritium sample holder.

6.2.13.2 If liquid is not present in the tritium sampler overflow bottle, go to step 6.2.14.

6.2.13.3 Pour the contents of the tritium overflow bottle into the tritium sample bottle. Contents of the overflow bottle should not exceed the volume capacity of the tritium sample bottle.

6.2.13.4 If the volume of liquid in the overflow bottle will overfill the tritium sample bottle, do not combine the two.

6.2.13.5 Remove the lid from a spare overflow bottle and place the lid on the overflow bottle just removed from the sampler.

6.2.13.6 Attach the clean tritium overflow bottle to the tritium sample holder by screwing it back into place.

6.2.13.7 Check hands for possible contamination with the Ludlum instrument and change surgeon's gloves as necessary.

6.2.13.8 If radioactive contamination is found, decontaminate, as necessary, all sample bottles and equipment.

6.2.13.9 If there is liquid in the overflow bottle, label per step 6.1.13 with the addition of the notice that this is the "Overflow Bottle". Otherwise label the bottle as "Potentially Contaminated Waste."

6.2.14 Remove the new tritium sample bottle, for the present location, from the tritium sample carrier.

6.2.15 Check the new tritium sample bottle label, and verify that the location on the label matches the actual location of the tritium sampler.

6.2.15.1 If the new tritium sample bottle is not the correct location, locate the correct new bottle in the carriers.

6.2.15.2 If the new tritium sample bottle is not in the carrier, reinstall the old tritium sample bottle and return to the Health and Safety to prepare the missing bottle(s) consistent with Section 6.1. Then restart activities at Section 6.2.

6.2.15.3 It is acceptable to have the missing tritium sample bottle delivered to you rather than implement step 6.2.15.2.

6.2.16 Remove the black cap from the new tritium sample bottle for the present location.

6.2.17 Screw the black cap onto the just-collected tritium sample bottle.

6.2.18 Place the just-collected tritium sample into the tritium sample carrier.

6.2.19 Attach the new tritium sample bottle to the tritium sample holder by screwing the bottle into the holder, using care to avoid damaging the fitted dispersion tip or the gasket material.

6.2.20 Check hands for possible contamination with the Ludlum instrument and change surgeon's gloves as necessary.

6.2.21 If radioactive contamination is found, decontaminate, as necessary, all sample bottles and equipment.

6.2.22 Observe the air flow by checking the ball-bearing indicator, in the air rotameter, located at the top of the tritium sample holder. Use the center of the ball as the location indicator.

6.2.22.1 If the flow rate is not 0.5 ± 0.05 lpm then record the original flow rate with an explanation in the comment section. The black line will correspond to a sampling flow rate of 0.5 ± 0.05 lpm.

6.2.22.2 Adjust, as necessary, by rotating the rotameter valve until the ball-bearing indicator is centered on the black line of the rotameter scale.

6.2.23 Check associated tubing on the HP vacuum supply line for maintenance problems.

6.2.24 Complete the Tritium Travel and Chain of Custody Sheet, noting any overflow bottles collected on the traveler or any abnormal conditions (i.e., required maintenance, empty tritium sample bottles, etc.). If a overflow bottle contains liquid, add "In 2 Bottles" (or an equivalent phrase) to the "Est. Volume Collected" value.

6.2.25 Repeat the steps from Step 6.2.8 through Step 6.2.24 until all tritium samples have been collected.

6.2.26 Follow the H&S procedures for exiting a control area.

6.3 Tritium Sample Disposition

6.3.1 After all the tritium samples have been collected, deliver the tritium samples to the Radiological Health Laboratory receiving station along with the Tritium Travel and Chain of Custody Sheets.

6.3.2 Complete, sign and date the Chain of Custody Sheet. The "form #" is typically "TCC-" your initials, a dash, and then the date. (Date should be in a MMDDYY format.)

6.3.3 Review with the Radiological Health Laboratory personnel the number of samples collected. Update or correct TTC form as necessary consistent with applicable procedures and the QAPD.

6.3.4 Have the Radiological Health Laboratory personnel sign the Tritium Traveler and Chain of Custody Sheet verifying that they have received the exact number of samples and bottles as recorded on the Tritium Travel and Chain of Custody Sheet.

6.3.5 Remove the tritium sample bottles from the tritium sample bottle carrier.

6.3.6 Discard any used ("potentially contaminated") tritium overflow bottles in the appropriate waste container.

6.3.7 Return the tritium sample carrier and other equipment to the supply storage area.

6.3.8 Any unused tritium overflow bottle maybe returned to storage or left in the bottle carrier based on Program Managers directions and chain-of-custody requirements.

6.4 Documentation

6.4.1 Make 3 copies of the tritium traveler and Chain of Custody Sheet.

6.4.2 Leave one copy with the Radiological Health Laboratory personnel, place one copy in the EMAT file cabinet, send one copy to the EMD Document Custodian, and give the original to the AQ&CT Division Program Manager.

7.0 Authentication

Authentication of the completion of this procedure is documented by signing the Chain of Custody Form in Section 6.3.

ATTACHMENT 1. TRITIUM SAMPLING LOCATIONS

Exhaust System I.D.	Collection Frequency
707-102	M-W-F
776-205	M-W-F
776-206	M-W-F
776-250	M-W-F
776-251	M-W-F
779-782	M-W-F

ATTACHMENT 2.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT **FORM 6.1A**

Tritium Chain of Custody Sheet
Form # TCC-__________

Location	Vol of Samp	Est Vol Coll	Date On	Off	Comments	Est Vol Recd in Lab
707-102	100					
776-205	100					
776-250A	100					
776-206	100					
776-251-1	100					
782-401	100					

EMAT ____________ ____________ ____________
Name Signature Date

Radiological
Health Lab ____________ ____________ ____________
Name Signature Date

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Title:
TRITIUM SAMPLER CALIBRATION

Approved By:

Director, EMD 10/4/91 (Date)

1.0 Purpose

This procedure establishes steps for calibrating Tritium samplers at effluent air sampling locations. (See 5-21200-OPS-AP.01, "Tritium Sample Collection" for a list of location numbers).

2.0 References

2.1 Source References

1. EG&G. Health and Safety Practices Manual. Rocky Flats Plant, Health and Safety.

2. EG&G. Health and Safety Plan Workbook. Rocky Flats Plant, Environmental Restoration. October 26, 1990.

3. EG&G. Radiological Operating Instructions.

4. EMD, "Quality Assurance Program Document," Environmental Management Department (21000-QAPD).

2.2 Internal References

1. EG&G, Health and Safety Program Plan. Rocky Flats Plant, Environmental Restoration. October 26, 1990.

2. HSP 2.04, "Employees Working Alone."

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By
Date 9 Oct 91

3. HSP 18.02, "Personnel Contamination Control Requirements for Radiologically Controlled Areas."

4. HSP 18.08, "Use of Step-Off Pads and H&S Barrier Areas in Radiologically Controlled Areas."

5. HSP 18.09, ""Self Monitoring - Combo Hand-and-Foot Monitors and Alpha-Mets."

6. HSP 18.12, "Radioactive Contamination and Decontamination."

7. ROI 6.1, "Performance Tests and Operational Checks for Ludlum Model 12-1A and 31 Survey Instruments."

8. 5-21200-OPS-AP.01, Effluent Tritium Sample Collection.

3.0 Test Equipment

3.1 Calibrated rotameter (with capability of measurement of 5.0 ± .05, lpm [500 ± 50 cc/min.])

4.0 Prerequisites

4.1 The EMAT performing the work described in this procedure will have received the training requirements and have a current building indoctrination for each building in which the work will be performed.

4.2 EMATs will receive on-the-job training and general instruction in the execution of their job responsibilities.

4.3 Obtain equipment and supplies required for the sampler calibrations:

- Ludlum 12-1A instrument
- Calibrated rotameter
- Plastic tubing and fitting
- Kim wipes
- Black grease pencil
- Surgeon's gloves
- Respiratory protection
- Respirator card
- Building indoctrination card
- Hazardous waste card
- Exemption badge for PA
- Tritium Calibration Worksheets

5.0 Limitations and Precautions

5.1 Personnel typically performing this work shall be qualified Environmental Monitoring & Assessment Technologists (EMATs). AQ&CT Division is responsible for the indoctrination and the hands-on environmental training and qualification of EMATs.

5.2 Calibrate the Tritium samplers during the first month of each calendar quarter, or whenever significant modifications to the exhaust system or tritium sampling apparatus are made.

5.3 AQ&CT Division will specify, in writing, any deviations from the normal calibration frequency that may occur during holidays, shutdowns, or other nonroutine periods of operation.

5.4 Two employees shall be present when activities in the procedure are performed, if this limitation is mandated by the security requirements for the area or HSP 2.04, "Employees Working Alone." Only one of these employees must be a qualified EMAT.

6.0 Procedures

6.1 Calibration Preparation

NOTE
Copy of ROI 6.1 will be needed to complete this activity.

6.1.1 Follow the calibration route specified by the AQ&CT Division Program Manager.

6.1.2 Obtain equipment and supplies.

6.1.3 Source calibrate a Ludlum 12-1A (ROI 6.1).

6.1.4 Check the calibration sticker on the calibration rotameter, and verify that the rotameter calibration expiration date has not been exceeded.

6.1.4.1 If the calibration date has expired, obtain an alternative rotameter, if available, and then repeat step 6.1.4.

6.1.4.2 If the calibration has expired and acceptable alternative rotameters weren't available, contact the AQ&CT Division Program Manager for instructions.

6.1.5 Check the rotameter's calibration label to verify that the calibration label indicates the point which corresponds to a airflow rate of 0.5, ±.05, lpm (500 cc/min.).

6.1.5.1 If the calibration label does not indicate a point which corresponds to 0.5 lpm, obtain a rotameter that conforms to the above stated criteria.

6.1.5.2 If the calibration label does not indicate a point which corresponds to 0.5 lpm and no appropriate flowmeter is available, contact the AQ&CT Division Program Manager for instructions.

6.2 Tritium Sampler Calibration

WARNING

Follow the H&S procedures for exiting the controlled area.

6.2.1 Go to the first/next building on the calibration route utilizing existing security procedures to access controlled areas.

6.2.2 Change into company-furnished clothing per H&S Practices Manual 18.02, as necessary, to satisfy clothing requirements.

6.2.3 Proceed to the first tritium sampler location.

6.2.4 Don surgeon's gloves.

6.2.5 Locate the tritium sampler flowrate meter. The sampler flowrate meter is located at the upper left side of the tritium sampler.

6.2.6 Obtain a kim wipe.

6.2.7 If flowrate is not consistent with current grease pencil mark and the valve indicated on the calibration sticker, note this in comment section.

6.2.8 Remove the black grease pencil mark from the sampler flowrate meter with the kim wipe.

6.2.9 Disconnect the airflow line from the bottom of the tritium sampler flowrate meter. The airflow line is the line from the sample extraction nozzle (in the exhaust duct) which connects to the sampler flowrate meter.

6.2.10 Record the time at which the flow was terminated.

6.2.11 Obtain the calibration rotameter.

6.2.12 Connect the airflow line, from the sample extraction nozzle, to the inlet (bottom) of the calibration rotameter.

6.2.13 Check hands on the Ludlum instrument for possible contamination and change surgeon's gloves as necessary.

6.2.14 Obtain the plastic tubing and a fitting, if not connected to rotameters.

6.2.15 Connect one end of the plastic tubing to the rotameter outlet (top), if not already connected.

6.2.16 Connect the other end of the tubing to the sampler flowrate meter inlet.

6.2.17 Check hands on the Ludlum instrument for possible radioactive contamination and change surgeon's gloves if necessary.

6.2.18 Locate the sampler vacuum valve. The vacuum valve is located on the discharge line of the knockout bottle of the tritium sampler.

6.2.19 While observing the calibration rotameter, adjust the sampler vacuum valve until a flow of 0.5, ±.05, lpm is obtained on the calibration rotameter. The center of the ball is considered the point being read.

6.2.20 Place a line on the flowrate meter through the center of the ball bearing indicator with the grease pencil.

6.2.21 Disconnect the calibration rotameter from the sampler flowrate meter, by disconnecting the plastic tubing at the bottom of the flowrate meter.

6.2.22 Disconnect the airflow line from the bottom of the calibration rotameter.

6.2.23 Connect the airflow line to the bottom of the sampler flowrate meter.

6.2.24 Observe the sampler flowrate meter to ensure that the ball-bearing indicator is still centered on the black grease pencil line. If necessary, adjust the vacuum valve until the ball-bearing indicator is centered on the black grease pencil line.

6.2.25 Fill out a Tritium Calibration Label (see Attachment 1). Information includes calibration date, tritium sampler number, and the EMAT's employee number or signature (on the "EMAT" line).

6.2.26 Affix the Tritium Calibration Label to the tritium sampler. Note the flowmeter reading on the calibration sticker ("Indicated Flowrate")

6.2.27 Complete the Tritium Sampler Calibration Worksheet. Required information includes calibration date, adjusted flowrate lpm, and initials of the EMAT performing the calibration. (The worksheet number is "TCL-" followed by the location number, then a dash, and finally the date. The date should be in a MMDDYY format).

6.2.28 Visually inspect the tritium sampler apparatus to make certain that it is in good operating condition and that tritium sample bottle and overflow bottle are properly positioned.

6.2.29 Note any problems with the calibration on the Tritium Calibration Worksheet in the comments column (e.g. required maintenance).

6.2.30 Proceed to the next sampler location, if any.

6.2.31 Repeat the Steps 6.2.1 to 6.2.30, until all samplers have been calibrated.

6.3 Documentation

6.3.1 Sign (on the upper half) and date the Tritium Calibration Worksheet to document the calibration of tritium samplers at effluent air sampling locations.

6.3.2 Copy and deliver the original Tritium Calibration Worksheets to the AQ&CT Division Program Manager.

6.3.3 Place a copy of the Tritium Worksheet in the EMAT file cabinet.

7.0 Disposition

The signatures on the Tritium Calibration Worksheets verify accurate completion of the critical portions of procedure. The responsible AQ&CT Division Program Manager will sign the worksheet after verifying the successful completion of the activity and the accuracy of the worksheet. The Program Manager will submit a copy of the signed Tritium Calibration Worksheet to the EMD records center.

ATTACHMENT 1

Calibration Sticker

Calibration Sticker

BLDG. ________ LOCATION ____________

ON ____________ SAMPLE # ______________

OFF ___________ H_2O VOL. _______________

VOL. M^3 ________ MONITOR _____________

ATTACHMENT 2

TRITIUM CALIBRATION WORKSHEET

Form # TSC - ______________

ROTAMETER

Mfg. ______________ Date: ______________

Model ______________ Bldg: ______________

Serial # ______________ EMAT: ______________

Cal Due Date: ______________ Employee #: ______________

Tritium Bubbler

	Identification No.	Adjusted Flowrate lpm	Comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Completed by: ______________ ______________
Signature Date

Approved: ______________

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Category 2	Organization:	Environmental Management

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TITLE:
VOLUMETRIC TSP/PM_{10} CALIBRATION, AMBIENT AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

Approved By: Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

REVIEWED FOR CLASSIFICATION/UCNI
By J. F. JENCHURA (UNU)
Date 10/17/91

2.0 PURPOSE AND SCOPE

This procedure will establish and document the requirements and responsibilities for calibration of the volumetrically flow controlled (VFC) total suspended particulate (TSP) and particulate matter with an aerodynamic diameter smaller than or equal to 10 microns (PM_{10}) samplers used at Rocky Flats Plant (RFP).

The purpose of the monitoring program is to quantify the concentrations of ambient particulates present during characterization and restoration activities at the investigation sites. Data may be used to address baseline risk assessment as well as environmental concerns. It's imperative that data is of high quality and totally defensible through proper record keeping and adherence to accepted methodologies, regulations, and guidelines.

3.0 RESPONSIBILITIES AND PROGRAM SUPPORT

Air sampling is performed pursuant to an Inter-Agency Agreement (IAG) among the Department of Energy (DOE), Colorado Department of Health (CDH), and the U.S. Environmental Protection Agency (EPA). These agreements stem from health and safety concerns for employees working on the project as well as the general public.

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Program manager is responsible to insure all particulate air sampling is performed in compliance with approved procedure and specific OU work plan, when applicable. Calibrations and maintenance activities are required at specified intervals. The program manager is responsible for completion and coordination of the following items:

1) Schedule Sampler Calibration,
2) Review calibration worksheets.

3.2 MAINTENANCE SUPPORT

Environmental Management Department (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform routine maintenance activities. Prior to field calibration activity, the sampler motors are replaced and the voltage control systems are inspected and reset if necessary. Other maintenance problems and issues require submission of RFP work request forms. Maintenance support is provided by Building 334 maintenance personnel. All maintenance is performed in accordance with procedure Number AP.12, Maintenance Procedure For RFP TSP HiVol Air Sampler.

3.3 AIR SAMPLER CALIBRATION

Technicians from the RFP Metrology Standards Laboratory perform multipoint calibrations on all samplers to characterize the flow capabilities of each samplers critical flow device. All calibrations are executed using a transfer standard traceable to the National Institute of Standards and Technology (NIST). All samplers require quarterly calibration in accordance with procedures contained in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.11.0, Reference Method for the Determination of Particulate Matter in the Atmosphere (High Volume PM_{10} Sampler Method), Revised November 1989, EPA-600/4-77-027a.

3.3.1 Calibration Assumptions

In this section, the following conditions are assumed:

- The sampler uses a choked-flow venturi to control actual volumetric flow rate.
- Flow rate is determined by measuring the stagnation pressure ratio, sampler is not equipped with a continuos flow recorder.
- Transfer standard for flow rate calibration is equipped with either a series of resistance plates or an intregal variable resistance valve.
- The sampler will be calibrated in actual volumetric flow-rate units (Qa). The orifice transfer standard is also calibrated in Qa.

3.3.2 On-Site Calibration Requirement

Calibration of some VFC samplers is affected by changes in line voltage, particularly if the line voltage is below normal (115 volts AC). For this reason, VFC samplers should always be calibrated at the monitoring site.

4.0 REFERENCES

4.1 SOURCE REFERENCES

CFR Title 40, Part 50, Appendix B. Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method).

U.S. Environmental Protection Agency, 1976. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II Ambient Air Specific Methods.EPA-600/4-77-027a.

Wedding and Associates, Inc, Operating Manual, The Wedding and Associates TSP Critical Flow High Volume Sampler.

4.2 INTERNAL REFERENCES

- SOP AP.12, Maintenance Procedure For RFP TSP HiVol Air Sampler.
- SOP AP.16, Restoration Programs Radioactive Air Particulate Sampling High Volume Method.
- SOP AP.09, Ambient TSP and PM_{10} Particulate Sampling, High Volume Method.

5.0 OPERATIONAL PROCEDURES

This document provides a step-by-step procedure for calibration of VFC TSP or PM_{10} particulate samplers. All procedures should be followed in the order presented. Calibration procedures are referenced to the manufactures instructions, as well as the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.11.0, Reference Method for the Determination of Particulate Matter in the Atmosphere (High Volume PM_{10} Sampler Method), Revised November 1989, EPA-600/4-77-027a.

- The calibration technician should read these procedures thoroughly and become familiar with the sampler prior to beginning calibration.

- The following equipment and materials are required for calibration of the samplers.

  - Calibration Orifice Transfer Standard with NIST Traceability,
  - Calibration Orifice Resistance Plates,
  - Rubber Stopper or Duct Tape,
  - Water or Oil Manometer with a 0 to 16-inch Range for Orifice Pressure Measurements,
  - Water or Oil Manometer with a 0 to 36-inch Range for Sampler Stagnation Pressure Measurement,
  - Thermometer with a 0° to 50°C Range, Accurate to ±1°C,
  - Aneroid Barometer with a Range of 500 to 800 mm Hg and Accurate to ±5 mm Hg,
  - Calibration Data Sheets,
  - Clean Filters.

NOTE: Do not calibrate the sampler during windy conditions. The calibration is less precise due to pressure variations associated with wind fluctuations.

5.1 PRE-CALIBRATION PROCEDURE

5.1.1 Calibration System Setup

The following procedure provides step-by-step instructions for proper set-up of the calibration system.

1) Install a clean filter on the filter cartridge.

2) Install the orifice baseplate on the filter cartridge.

3) Install the calibration orifice on the baseplate.

4) Tighten the faceplace nuts evenly on alternating corners to properly align and uniformly seat the gaskets. The nuts should be hand tightened only; too much compression may damage the sealing gaskets.

5.1.2 Calibration System Leak Test

The following section provides a simple procedure for testing the integrity of the calibration system prior to starting calibration.

1) Block the orifice with a rubber stopper or duct tape.

2) Seal the orifice pressure port with a stopper or tape.

3) Turn on the sampler. To avoid overheating the sampler motor do not operate for more than 30 seconds with orifice blocked. This can damage the motor.

4) Gently rock the orifice standard and listen for a whistling sound that would indicate crossthreading of the orifice to the baseplate, or unevenly tightened faceplate nuts. All leaks must be eliminated before proceeding with the calibration.

5) Turn off sampler and unblock the calibration orifice.

5.2 CALIBRATION

The information provided in this section should be followed closely and performed in the order listed. This section details the actual calibration activity. Minor errors in reading instruments and recording data at this stage may introduce profound uncertainty regarding data validity.

1) Inspect the manometer tubing for crimps or cracks. Open the manometer valves and gently blow through the tubing, watch for the fluid in the manometer flow.

2) Adjust the manometers' sliding scales to position the zero lines are at the bottom of the meniscuses.

3) Connect the transfer standard manometer to the orifice. Connect the stagnation pressure manometer to the stagnation pressure port on the side of the sampler. Ensure that one side of each manometer is open to the atmosphere. Make sure the tubing fits snugly on the pressure taps and on the manometers.

4) Read and record the following information on the calibration data sheet (Fig. 1).

   a) Date, Location, and Operators Signature;
   b) Sampler Serial Number and Model;
   c) Ambient Barometric Pressure (Pa), mm HG;
   d) Ambient Temperature (Ta), °C and K (K= °C + 273);
   e) Orifice Serial Number and Calibration Relationship.

5) Turn on the sampler and allow it to warm up to operating temperature (three to five minutes).

6) Read and record the orifice transfer standard's manometer reading on the calibration data sheet in the delta H_2O column.

7) Read the samplers relative stagnation pressure manometer reading in inches H_2O. Convert the reading in inches H_2O to mm Hg. (mm Hg.=25.4(in. H_2O/13.6)) and record on the calibration data sheet in the delta Pstg column.

8) Generate at least three additional flows by inserting the orifice resistance plates or adjusting the variable orifice. For each flow generated, repeat step 7 and record the results on the calibration data sheet.

9) On a sheet of graph paper, plot the calculated orifice transfer standard's flow rates, Qa (orifice), on the x-axis vs the corresponding stagnation pressure ratios, (P1/Pa), on the y-axis. Draw a curve through the plotted data.

Stagnation Pressure Ratio: P1/Pa

Absolute Stagnation Pressure: P1 = Pa-Pstag

Where:

P1 = Absolute Stagnation Pressure, mm Hg.

Pa = Ambient Barometric Pressure, mm Hg.

Pstag = Relative Stagnation Pressure, mm Hg.

Note: The data should be plotted in the field at the time of calibration. Re-run any calibration points that vary by more than 10 percent from the ideal slope for the calibration curve.

10) Turn off the sampler and remove the orifice transfer standard.

11) Install a clean filter on the sampler in the normal sample configuration. Turn on the sampler and allow it to come to operating temperature.

12) Read and record the relative stagnation pressure as in step 7 above. Record it on the calibration data sheet as the operational flow rate.

13) Turn off the sampler.

5.2.1 Calibration Calculations

All calibration data should be collected, including the orifice calibration information and the sampler calibration data sheet.

Note: These calculations should be performed at the time of calibration.

1) Verify the orifice transfer standard calibration is current and traceable to a primary standard.

2) Calculate and record Qa (orifice) for each calibration point from the orifice calibration information and the following equation:

$$Qa\ (orifice) = \{[delta\ H_2O(Ta/Pa)]^{1/2} - b\}\ \{1/m\}$$

Where:

Qa (orifice) = Actual Volumetric Flow Rate as Indicated by the Transfer Standard Orifice, m^3/min

delta H_2O = Pressure Drop Across the Orifice, Inches H_2O

Ta = Ambient Temperature During Calibration, degrees K (K = °C + 273)

Pa = Ambient Barometric Pressure During Calibration, mm Hg

b = Intercept of the Orifice Transfer Standard's Calibration Relationship

m = Slope of the Orifice Transfer Standard's Calibration Relationship

3) Calculate and record the value of the absolute stagnation pressure, P1, for each calibration point:

P1 = Pa - Pstag

Where:

P1 = Absolute Stagnation Pressure, mm Hg

Pa = Ambient Barometric Pressure, mm Hg

Pstag= Relative Stagnation Pressure, mm Hg

4) Calculate and record the stagnation pressure ratio: Stagnation pressure ratio = P1/Pa.

5) On graph paper, plot the calculated orifice transfer standard's flow rates, Qa (orifice) on the x-axis vs the corresponding stagnation pressure ratios on the y-axis. Draw a curve through the plotted data.

6) Compare Qa (orifice) with Qa (sampler), (determined from the factory sampler calibration lookup table at ambient temperature) for several points on the calibration plot. Calculate the percentage difference between Qa (orifice) and Qa (sampler) using the following equation:

Percent Difference = {[Qa (sampler) - Qa (orifice)]/Qa (orifice)} [100]

If the agreement is within three or four percent, the factory calibration is validated and may be used for subsequent sample periods. If the sampler under calibration is a PM_{10} proceed to Subsection 4.2.3. If the sampler is a TSP the calibration is now complete.

7) If the agreement in step 6 is not within three or four percent, recheck the accuracy of the calibration and calculations. Verify that the transfer standard calibration is within the certification date. Look for leaks, manometer reading errors, incorrect temperature, and pressure data. Check the line voltage at the site (it should be at least 110 volts AC). Verify the correct type blower motor is installed, check for the presence and integrity of the gasket located between the blower and the venturi housing. It is unlikely the factory calibration will be in error by more than a few percent. Generally, larger variations are the result of a sampler or calibration problem. If no errors with the sampler or calibration can be found, proceed as described in Subsection 4.2.2.

4.2.2 Generation of Calibration Relationship - VFC Sampler

This section provides the equations and information needed to determine the relationship between the flow standard corrected to average operating conditions and the average actual sampler flow.

1) For each calibration point, calculate and record the quantity,

$Qa(orifice)/[Ta]^{1/2}$

Where:

Qa(orifice) = Actual Volumetric Flow Rate as Indicated by the Transfer Standard Orifice, m^3/min

Ta = Ambient Temperature During Sampler Calibration, K (K = °C + 273)

2) For the linear regression model, y = mx + b, let y = P1/Pa and let x = Qa(orifice)/$[Ta]^{1/2}$. The model is given by:

$$P1/Pa = m[Qa(orifice)]/[Ta]^{1/2} + b$$

3) For subsequent sample periods, the sampler's average actual operating flow rate is calculated from the calibration slope and intercept using the following equation;

$$\overline{Qa}\ (sampler) = \{[\overline{P1/Pav} - b][Tav]^{1/2}\}\{1/m\}$$

Where:

$\overline{Qa}$ (sampler) = the Sampler Average Flow Rate m^3/min

$\overline{P1/Pav}$ = Average Stagnation Pressure Ratio for the Sampling Period

Tav = Average Ambient Temperature for the Sampling Period, K (K = °C + 273)

b = Intercept of the Sampler Calibration Relationship

m = Slope of the Sampler of the Calibration Relationship

4.2.3 PM_{10} Single-Point Operational Flow-Rate Verification

This procedure compares the VFC sampler's normal operating flow rate to the design flow rate of the sampler inlet (e.g., 1.13 m^3/min).

1) Determine the value of P1/Pa for the operational flow rate obtained with only the filter cassette installed (steps 11 and 12 of Section 4.2).

2) Determine the samplers operational flow rate Qa(sampler) that corresponds to this P1/Pa. Use the lookup table if it has been validated in step 6 of Section 4.2.1; otherwise use the equation in step 3 of Section 4.2.2.

3) Compare Qa(sampler) with the inlet design flow rate of 1.13 m^3/min using the following equation:

$$\text{Design Flow Rate Percent Difference} = \{[Qa(sampler) - 1.13]/1.13\}\ [100]$$

This design flow rate percentage difference must be less than the allowable flow rate tolerance (i.e., ±10 percent). However, this value should be well within ±7 percent to allow for some variation with ambient temperature. If it is not within ±7 percent, recheck the calibration procedure for data errors. Check the sampler for leaks, bad motor brushes, missing gaskets, incorrect motor type, or low line voltage. Because the VFC flow rate is not adjustable, the manufacturer must be consulted to resolve cases of substantially incorrect VFC flow rates.

VFC SAMPLER CALIBRATION DATA SHEET

Station Location ______________________ Date ______________ Time ________

Sampler Model ____________ S/N ______________ Operator ____________

Pa ______mm Hg Ta ______°C ________K Unusual Conditions ________________

Orifice S/N ______________________, Orifice Calibration Date ______________

Orifice Calibration Relationship: m = ____________ b = __________ r = ____________

Plate No.	ΔH_2O (in.)	ΔPstg (mm Hg)[a]	P1=Pa-ΔPstg (mm Hg)	P1/Pa (mm Hg)	Qa (orifice) flow rate[b] (m^3/min)	$\frac{Qa(orifice)}{[Ta]^{1/2}}$
Operational Flow Rate						

[a]mm Hg = 25.4 (in. H_2O/13.6)

[b]Qa (orifice) = 1/m $\{[(\Delta H_2O)(Ta/Pa)]^{1/2}\text{-}b\}$

[c]% Difference = $\frac{Qa(sampler) - Qa(orifice)}{Qa(orifice)}$ (100)

Qa (Orifice)	Qa (Sampler) (Lookup Table)	% Difference[c]

Sampler Calibration Relationship

☐ Lookup Table Validated (i.e., % difference < 3 or 4)

☐ New calibration relationship:

(X = Qa(orifice)/$[Ta]^{1/2}$, Y = (P1/Pa)

m = ____ b = ____ r = ____

For Subsequent calculation of sampler flow rate:

Qa = $\{[P1/Pa - b][Ta]^{1/2}\}$ {1/m}

Operational Flow Rate ______m^3/min

AMBIENT TSP/PM_{10} AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

EG&G ROCKY FLATS PLANT	Manual:	5-21000-OPS
EMD MANUAL OPERATION SOP	Procedure No.:	AP.09, Rev. 0
	Page:	1 of 15
	Effective Date:	October 1, 1991
Category 2	Organization:	Environmental Management

This is a CONTROLLED DOCUMENT
EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

This is a RED Stamp

TITLE:
AMBIENT TSP/PM_{10} AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

Approved By:
Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

This document outlines the required steps for proper field operation of the criteria dust air samplers, total suspended particulate (TSP) and particulate matter with an aerodynamic diameter smaller than or equal to 10 microns (PM_{10}). Included are descriptions of air sampling equipment, sampler operation, filter exchange, filter preparation, and gravimetirc filter analysis.

The purpose of the monitoring program is to quantify criteria dust concentrations at the Rocky Flats Plant (RFP). This procedure is applicable to all ambient environmental TSP and PM_{10} measurements made at RFP.

3.0 RESPONSIBILITIES AND PROGRAM SUPPORT

Air sampling at the operable units (OU) at RFP is performed pursuant to an Interagency Agreement (IAG) among the Department of Energy (DOE), Colorado Department of Health (CDH), and the U.S. Environmental Protection Agency (EPA). These agreements stem from health and safety concerns for employees working on the project as well as the general public.

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Program manager is responsible to insure all particulate air sampling is performed in compliance with approved procedure and specific OU work plan, when applicable. The program manager is responsible for completion and coordination of the following items:

1) Operation and maintenance of the sampling network including supervision of the field sampling staff.
   a) Schedule Site Checks,

b) Schedule Preventive Maintenance Activities,

c) Schedule Sample Collection,

d) Schedule Sample Analysis,

e) Schedule Sampler Calibration.

2) Coordination of Maintenance Work Requests for Repair of Inoperable Samplers.

3) Preparation of a monthly ambient air report for submission to the OU project manager, when applicable.

4) Data analysis and preparation of data reports for non OU sampling activities when applicable.

5) Procurement of samplers, supplies, expendables, and spare parts inventory.

3.2 FIELD PERSONNEL DUTIES

The Environmental Management Department (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform the field sampling. The EMATs principal responsibility is to record data and change filters on each air monitoring sampler. EMAT's are also responsible for the gravimetric analysis of sample filters under the supervision of the project manager.

3.3 MAINTENANCE SUPPORT

The EMATs inspect the samplers to insure they are operational. Other maintenance problems and issues require submission of RFP work request forms. Maintenance support is provided by Building

334 maintenance personnel. All maintenance is performed in accordance with procedure No.5.1.2, Maintenance Procedure For RFP TSP HiVol Air Sampler.

3.4 AIR SAMPLER CALIBRATION

The Metrology Standards Laboratory performs a multipoint calibration on all new samplers to characterize the flow capabilities of each orifice. All calibrations are executed using a transfer standard traceable to the National Institute of Standards and Technology (NIST). Subsequent calibrations consist of a single point flow check and are performed on a quarterly basis. The above calibration equipment and schedule will be used for volumetrically flow controlled samplers until it has been established that the calibration "Look Up Table" provided with each sampler is within three to four percent of the calibration values obtained using the certified transfer standard. Once this has been determined, the "Look Up Table" will be used to determine flow rate data. Mass flow controlled samplers require quarterly calibration and adjustment in accordance with procedures contained in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.2, Reference Method for the Determination of Suspended Particulates in the Atmosphere (High Volume Method) EPA-600/4-77-027a. All multipoint calibrations will be conducted in accordance with the above reference. The Standards laboratory is responsible for calibration of the analytical balance used to weigh sample filters.

4.0 REFERENCES

4.1 SOURCE REFERENCES

CFR Title 40, Part 50, Appendix B. Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method).

U.S. Environmental Protection Agency, 1976. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II Ambient Air Specific Methods. EPA-600/4-77-027a.

U.S. Environmental Protection Agency, 1983. Region 8, Policy for Correcting TSP Data to Reference Conditions.

Colorado Air Quality Control Commission's (AQCC) Regulation 1, Section III, Fugitive Particulates.

Wedding and Associates, Inc, Operating Manual, The Wedding and Associates TSP Critical Flow High Volume Sampler.

Sierra Anderson, Inc, Operators and Instruction Manual, PM_{10} High Volume Air Sampler System

4.2 INTERNAL REFERENCES

- SOP AP.12, Maintenance Procedure For RFP TSP HiVol Air Sampler.
- SOP AP.11, Mass Flow TSP/PM_{10} Calibration, Ambient Air Particulate Sampling, High Volume Method.
- SOP AP.08, Volumetric TSP/PM_{10} Calibration, Ambient Air Particulate Sampling, High Volume Method.

5.0 OPERATIONAL PROCEDURES

The operational status of all particulate air samplers is checked during each sampling period. Performance data is collected by the EMAT when preparing the sampler for operation and at the end of the sample period.

5.1 FILTER INSTALLATION AND REMOVAL PROCEDURE

- The EMAT will pick up the government vehicle at the Building T130B parking area and return it to this location when not in use.

- The following supplies and equipment will be need and are available at the Ambient Air Monitoring station:

  - Log Sheets
  - 36-inch U-tube Manometer
  - Thermometer
  - Pen or Pencil
  - Protective/Identification Envelopes
  - Clean Pre-Weighted and Numbered Filters
  - Pen or Pencil
  - Colorado Sampling Schedule Calendar

5.1.1 Filter Installation

The filters will be installed not more than one day in advance of the samplers scheduled run date. The following steps should be followed in the order given when installing a sample filter.

1) Open the sampler lid and secure in place.

2) Before installation of a clean filter, clean the rubber gasket on the faceplate to remove any filter fibers or dirt. Use a clean dry cloth or paintbrush to clean the area surrounding the filter holder.

3) Record the following information on the filter envelope in the printed space provided:

    a) Project Number,
    b) Filter Number,
    c) Sample Collection Date,
    d) Sample Start Time,
    e) Sampler ID

4) Carefully remove a clean filter from the box and place it on the filter holder. Check the filter number against the envelope to assure the proper filter has been installed. If the filter is damaged, discard it and use the next filter. Center the filter on the screen so that when the faceplate is installed it will form an airtight seal on the outer edge of the filter. Hand tighten the faceplace nuts.

5) Install the filter holder on the sampler. Screw the wing nuts on to secure the filter cassette in place (**DO NOT OVER TIGHTEN WING NUTS**).

6) Turn on the sampler and allow it to warm up for approximately five minutes.

7) Inspect the manometer and tubing for cracks or leaks. Adjust the sliding scale on the manometer so the zero lines are at the bottom of the meniscuses. Connect the manometer tubing to the exit orifice plenum tap on the sampler motor. Read and record the manometer deflection on the sample envelope.

8) Disconnect the manometer and turn off the sampler.

9) Set the samplers timer to begin the sample at midnight on the appropriate day. Record the elapsed time meter reading on the filter envelope (Figure AP.09-1).

10) Close and latch the sampler door and lid.

11) Transcribe all information from the filter envelope into the ambient station site log. Note any conditions which may impact the sampling for this period, dust storms, construction activity, etc.

5.1.2 Filter Removal

The exposed filers will be removed not more than one day following the sample date. The following steps should be followed in the order given when removing a sample filter.

1) Open the lid to the sampler and secure. Open the sampler door.

2) Turn on the sampler and allow to warm up for approximately five minutes.

Figure AP.09-1

ROCKWELL ROCKY FLATS ENVIRONMENTAL ANALYSIS
TOTAL SUSPENDED PARTICULATES SAMPLE

Sample Date ________ Location ______________
Filter Number ________ Station Number _________
Last Cal. Date ______________
Pressure Start _____Ins. H_2O Pressure End ____Ins. H_2O
Average Pressure _____ Average Flow ______ CFM
Elapsed Time Start ________ Elapsed Time End ____
Length of Run ____________________ Minutes
Final Weight _________ - _________ grams
Tare Weight _________ - _________ grams
Net Weight _________ - _________ grams

TSP ________________________	$\mu g/m^3$
Air Volume ____________________	std m^3
Lab Control No. ____________________	
Amb. Temp. ____________________	°C
Amb. Press. ____________________	mb
Lead Value________________	μg Pd/m^3

3) Inspect the manometer and tubing for cracks or leaks. Adjust the sliding scale on the manometer so the zero lines are at the bottom of the meniscuses. Connect the manometer tubing to the exit orifice plenum tap on the sampler motor. Read and record the manometer deflection on the sample envelope.

   NOTE: The envelope should be marked with the sampler identification number, the initial flow rate, final flow rate, date and elapsed time readings (initial and final).

4) Turn the sampler off.

5) Loosen the wing nuts that the secure the filter holder to the sampler. Remove the filter holder and take it inside the ambient station to change the filter. At a remote site the filter may be inspected and changed in the cab of the sample truck.

6) Remove the two nuts that secure the faceplate to the filter holder cassette. Gently remove the faceplate. Inspect the faceplate and filter for any of the following:

   a) Check the filter for signs of leakage. The border area around the edge of the filter may appear smudged as a result of poor alignment or leakage. A appearance of "fuzziness" of the sample outline is a good indicator of leakage.

   b) Inspect the filter for signs of cutting along the border area and gasket interface (usually the result of overtightening of the faceplate).

c) Examine the filter for signs of damage. Physical damage occurring after the sample has been collected will not always invalidate the sample. If the filter is torn during removal, and no sample is lost the filter will not be invalidated. If material is dislodged and lost during sample removal the sample will be invalidated, for this reason care should be taken when handling the filters. Note any filter handling problems on the sample envelope.

7) Gently remove the filter from the filter holder. Fold the filter in half with the exposed side folding on to itself. Place the filter in a glassline sleeve, and then into the filter folder, place the folder into the sample envelope.

8) Transcribe all pertinent information into the site log. Be sure to include all sample data, ie., sample date, sampler ID, beginning and ending flow measurements and elapsed time readings.

9) Place the exposed filters in the filter storage container in the ambient monitoring station.

5.2 FILTER PREPARATION

Only quartz fiber filters with a collection efficiency of 99% or greater for 0.3 micrometer particles will be used.

5.2.1 Pre - Sampling Filter Inspection

The following inspection is necessary prior to filter conditioning and weighing.

1) Inspect each filter with a light table or other suitable device. Discard filters with pin holes, tears or creases.

2) Assign a serial number to each filter. Stamp the number on the right hand corner of the filter in an area covered by the faceplate gasket.

5.2.2 Filter Conditioning

The analytical balance is located in the ambient air monitoring station. The room is temperature controlled. Room temperature should be maintained between 20° and 25°C. The relative humidity in the room should be maintained at a level less than 50 percent.

1) Put filters in the desiccator cabinets and allow to equilibrate for 24 hours before weighing.

2) Check the temperature and humidity conditions in the station before weighing filters. If limits are exceeded do not proceed.

5.2.3 Filter Weighing - Pre-Sampling

The particulate concentration is calculated by gravimetrically measuring the mass of collected particulates and dividing the mass by the volume of air sampled. It's of the utmost importance that care and attention to detail be given the filter weighing process, as well as all filter handling activities. Small errors in weighing or recording weight may cause significant error in the resultant particulate concentration.

1) Verify the balance calibration any time the balance has been subjected to rough handling, moving, or during routine operation when a standard weight can not be weighted within ±0.5 milligram (mg) of it's standard weight.

2) Select three Class "S" weights covering a weight range normally encountered in the filter weighing process (3 to 5 grams). Weigh the selected weights. If at any time one or more of the weights can not be measured within ±0.5 mg of its standard value, have the balance recalibrated. Record the results of these tests in the analytical balance log book and initial. Report any discrepancy to the air program manager.

3) Weigh a quantity of filters sufficient for a two month period at one time.

4) Weigh the filter, record the filter weight to the nearest milligram. Record the tare weight and filter serial number in the filter log book.

5) After weighing, do not fold or crease the filter. Pack the filters in their original box or similar container. Place a piece of $8^1/_2$ by 11 inch tracing paper between each sheet. Stack the filters in numerical order so they can be installed in chronological order. Store the filters in the ambient air sampling station.

5.2.4 Gravimetric Filter Analysis

The particulate concentration is calculated by gravimetrically measuring the mass of collected particulates and dividing the mass by the volume of air sampled. It's of the utmost importance that care and attention to detail be given the filter weighing process, as well as all filter handling activities. Small errors in weighing or recording weight may cause significant error in the resultant particulate concentration.

1) Examine the information on the sample envelope to verify it is a valid sample for analysis. If any information is missing from the sample envelope note the filter and sample number. Notify the air programs manager, and cheek the information on the filter envelope with the information contained in the ambient air station log. The sample will be voided if:

    a) Insufficient data is provided on the envelope, site log book, and is unobtainable from the EMAT who performed the sampling.

    b) Sampler malfunctions are evident, filter has been damaged in handling and sample material is lost.

2) Examine the shipping envelope for material that may have become dislodged from the sample. If such material is found, recover as much as possible by brushing it from the envelope to the deposit on the filter with a soft camel hair brush.

3) Examine the filter for insects embedded in the sample deposit. If insects are found, remove them with Teflon tipped tweezers, **use care not to disturb the sample.** If more than ten insects are found on one sample, refer the sample to the air program manager for a determination of acceptance or rejection of the filter.

4) When invalidating a sample for any of the reasons mentioned, record the reason directly on the sample envelope label, and in the ambient site log, and the filter log.

5) Repeat all Steps 1 and 2 contained in Subsection 4.2.2 above.

6) Repeat Steps 1, 2, and 4 contained in Subsection 4.2.3 above. Record the final weight on the filter envelope in the space provided and in the filter log book.

7) Replace the filter in the sample envelope. Put the envelope in the filter storage box.

   Note: RFP will maintain exposed filters for a period of at least three years in the event additional analysis is required.

RADIOACTIVE AMBIENT AIR MONITORING PARTICULATE SAMPLING DATA REDUCTION

EG&G ROCKY FLATS PLANT	Manual:	5-21000-OPS
EMD MANUAL OPERATION SOP	Procedure No.:	AP.10, Rev. 0
	Page:	1 of 33
	Effective Date:	October 1, 1991
Category 2	Organization:	Environmental Management

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ENVIRONMENTAL MANAGEMENT DEPARTMENT

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TITLE:
RADIOACTIVE AMBIENT AIR MONITORING PARTICULATE SAMPLING DATA REDUCTION

Approved By:

Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

This document outlines the process for calculating the Radioactive Ambient Air Monitoring Program (RAAMP) monthly air data. Directions for preparation of the monthly ambient air report for inclusion in the Rocky Flats Plant (RFP) Monthly State Exchange of Information meeting is also included. The data is prepared with the use of the SAS statistical program and Oracle database program.

The purpose of RAAMP is to pursue the regulatory requirements and technical reponsibilities for routine radioactive ambient air sampling at RFP. The focus of RAAMP is directed towards sampling and analysis of radioactive ambient air concentrations, verification and documentation of surveillance operations, trending and assessment of assembled data, and production of environmental reports. The ambient air monitoring program is continually upgraded to improve the existing network. The end result is established protocols and procedures to produce high quality data, documentation, and reports that are able to withstand intense scientific, regulatory, legal, and public scrutiny. The scope of the RAAMP is environmental surveillance, assessment, reporting, and compliance. This document provides instructional information to the program manager, program manager's backup, and any personnel requiring access to the SAS database.

3.0 INSTRUMENT STANDARDIZATION AND CALIBRATION

Air samplers of the RAAMP network are calibrated biannually by the Physical Metrology Laboratory (PML). Calibration is done by comparing the flow indicator readings on the air sampler meter with the standard flow tube metering under full scale flow and minimum flow conditions. Several intermediate flow levels are also checked through the entire flow range of the sampler indicator. The air sampler flow zero dampening, and span adjustment screws are located on the meter face. The standard reference volumetric flow rates and the average observed flow rates registered by the air sampler flowmeter are reported to the RAAMP manager. The calibrations confirm air sampler volumes reflect the actual air sampling rate. Additional information concerning equipment setup and operation can be found in the RFP procedure "High Volume Air Sampler Calibration," S-P-08003.

4.0 CALCULATIONS AND RECORDS SPECIFICATIONS

The RAAMP manager is responsible for monthly air data calculations and preparation of a monthly ambient air report for inclusion in the RFP Monthly Environmental Monitoring Report. This data is also presented publicly at the Monthly Environmental Monitoring Council Meeting. The following information is a guideline for preparation of this report. Three categories of data are recorded for analysis.

4.1 AIR FLOW

Air flow readings are recorded in the RAAMP field log by the Environmental Monitoring and Assessment Technologist (EMAT) conducting the air route. Copies are given to the RAAMP manager. Each sheet reports the date, elapsed time in hours, and flow rate (cm/m) for each individual air sampler during an initial, mid-point inspection and final reading. Data is reported for a maximum of fifty-three air samplers, although a reduced number may occur through unplanned operability anomalies.

Processing: Volumes of airflow are calculated weekly and then totaled for the interval specified in the RFP monthly report. Calculations for the weekly volumes are as follows:

a) $E = (T2-T1) \bullet 60$

b) $C=[(F2 + F1)/2) \bullet 1000 * M) + B)] .001$

c) $V = E * C$

Where:

T1	=	Start of the Sampler Interval (Hours)
T2	=	End of the Sample Interval (Hours)
F1	=	Flow Rate at T1 (Cubic Meters Per Minute)
F2	=	Flow Rate at T2 (Cubic Meters Per Minute)
M	=	Slope of the Linear Calibration Equation (Y = MX + B)
B	=	Dependent Variable Intercept of the Linear Calibration Equation (Y = MX + B)
E	=	Elapsed Time (Minutes)
C	=	Calibrated Airflow (Meter Cubed/Minute)
V	=	Volume of Air (Meters Cubed)

4.2 PLUTONIUM CONCENTRATIONS

Plutonium samples are composited at intervals specified by the RAAMP manager. These intervals vary according to the location of the sampler (i.e., onsite, perimeter, or community). Samples from all three locations are composited monthly.

Results of laboratory analysis on air filters are reported monthly from the 123 RH Laboratory as output from the Flow II Gemini system. Interval, plutonium concentration, and an error factor are given for each air sampler. Multiple intervals per air sampler may be reported depending on the schedule for compositing samples. Corrections to the plutonium values and accounting for the blank lab sample are electronically transferred to the RAAMP manager.

Plutonium Concentration: Disintegrations per minute (dpm) for composite intervals are summed for the period specified for the monthly report. Then they are converted to picocuries (pCi) by dividing by 2.22. This value is divided by air volume for the same period to determine plutonium concentration. Error factors are calculated in the same manner.

The formula for monthly plutonium concentration is as follows:

$$\text{Total pCi/m}^3 = \text{Total pCi} / \text{Vstd}$$

where:

$$\text{Total pCi} = \text{DPM} / 2.22$$

Vstd = Total Air Sampled in Standard Volume Units, Std m^3

5.0 PROCEDURE FOR DATA INPUT INTO THE SAS PROGRAM

RAMMP PLUTONIUM BIWEEKLY DATA WILL BE INPUT INTO THE CLASSIFIED VAX AS FOLLOWS:

NOTE: UNDERLINED WORDS ARE FOR DEMONSTRATION PURPOSES ONLY

1) **EDIT FILENAME;**
   EXAMPLE: EDIT OAWK1990.SAS;

   OAWK - ONSITE, AIR, WEEK
   PAWK - PERIMETER, AIR, WEEK
   CAWK - COMMUNITY, AIR, WEEK
   O=ONSITE
   P=PERIMETER
   C=COMMUNITY

A=AMBIENT AIR PROGRAM

WK19=WEEK NUMBER IN THE CURRENT YEAR

YR90=CURRENT YEAR

NOTE: screen will read "File does not exist", continue with next step.

2) C (C will connect SAS program to file).

3) **LIBNAME ENVIRON '[R+employee number]';**

EXAMPLE: LIBNAME ENVIRON '[R511145]';

Libname directs SAS where to file the input data.

4) **DATA ENVIRON.FILENAME;**

EXAMPLE: DATA ENVIRON.OAWK1990;

OAWK=Onsite, Air, and Week + Current Year

PAWK=Perimeter, Air, and Week + Current Year

CAWK=Community, Air, and Week + Current Year

NOTE: THIS FILENAME SHOULD BE THE SAME AS IN STEP NO. 1 (this names the SAS dataset and will put SSD on the end)

5) **DATE1='YYMMDD';**

DATE2='YYMMDD';

DATE3='YYMMDD';

NOTE: THIS DATA IS TAKEN FROM THE ELAPSED TIME AND FLOW RATE LOG SHEET

DATE1=INITIAL DATE OF SAMPLING PERIOD

DATE2=INSPECTION DATE OF SAMPLING PERIOD

DATE3=FINAL DATE OF SAMPLING PERIOD

EXAMPLE: DATE1='900519';

DATE2='900526';

DATE3='900601';

Sampling intervals+w biweekly dates.

YY=current year

MM=current month (two digits)

DD=day of biweekly sampling period

6) **INPUT SAMPLER$ TIME1 FLOW1 TIME2 FLOW2 TIME3 FLOW3;**

7) CARDS; Cards statement and a semicolon for data to enter.

Input statement for entering data.

EXAMPLE:

CARDS;

S-01 4936.3 0.88 5104.0 0.84 5135.0 0.00

8) DATA MUST HAVE A SEMICOLON AFTER THE LAST DATA ENTRY (;) IN ORDER FOR DATA TO ENTER

EXAMPLE:

S-44 28879.7 0.83 29047.7 0.83 29215.5 0.81

9) PROC PRINT DATA=ENVIRON.FILENAME;

EXAMPLE: PROC PRINT DATA=ENVIRON.OAWK1990;

Filename will consist of onsite, perimeter, or community. Check number 4 as a reference.

10) TITLE 'AIR FLOW DATA FOR LOCATION WEEK 19 - 1990';

LOCATION EXAMPLE: ONSITE
PERIMETER
COMMUNITY

11) CONTROL Z (press control Z)

12) *EXIT - TO SAVE
*QUIT - TO NOT SAVE

6.0 PROCEDURE TO RUN DATA

1) $ SAS FILENAME.SAS

EXAMPLE: $SAS OAWK1990.SAS

Step one compiles data from the VAX into SAS Datasets.

NOTE: THIS FILENAME IS THE SAME AS IN SECTION 5.0 NUMBER 1

Repeat for all Dataset names and sampling dates.

EXAMPLE: $SAS OAWK1990.SAS

$SAS PAWK2090.SAS

$SAS CAWK2090.SAS

2) TO REVIEW DATA FOR MISTAKES:

AFTER FILE HAS BEEN RUN IN SAS, SAS MAKES TWO FILES:

a) LOG - the log file shows where errors are made and if a step is processed.

b) LIS - the lis file lists data output when a procedure produces output

TO REVIEW THE LOG FILE:

$TYPE FILENAME.LOG

EXAMPLE: $TYPE OAWK1990.LOG;

Change FILENAME for appropriate data. Be aware of observations, error messages, and variable heading. (watch the screen closely because this file scrolls by quickly)

IF A MISTAKE IS FOUND

Correct mistake by **$ EDIT** filename.SAS (this is the same as step 5.0 No. 1)
example: $EDIT OAWK1990.SAS

Sas the file again

example: $ SAS OAWK1990. SAS

Review the log file again

$TYPE filename.LOG

example: $TYPE OAWK1990.LOG

(If no error messages and no mistakes, look at list file)

Review the list file

$TYPE filename.LIS

example: $TYPE OAWK1990.LIS

7.0 PROCEDURE TO CREATE AIRFLOW DATA SET FROM ORACLE

1) Change directory to 'air'

A) c:\> cd air <ret>

c:\air>

2) Edit 'airflow1.sql' program. Change filename and date.

A) c:\air> EDLIN AIRFLOW1.SQL <ret>

B) * L <ret>

This lists the program.

(change line 1 - filename)

C) * 1 <ret>

1) 1:spool airMMYY.dat <ret> (MMYY = Month and Year)
(change line 12 - date)

D) * 12 <ret>

1) 12:FROM AIRFLOW WHERE FNEW_DATE >='DD-MMM-YY' <ret>

(DD = day, MMM = 3 character Month, YY = Year)

E) * END <ret>

c:\air>

3) Connect to Oracle

A) c:\air> oracle <ret>

1) user: air <ret>
2) password: air <ret>

4) Connect to SQLPLUS and run 'airflow1.sql' to create the data file.

A) c:\air> sqlplus <ret>

B) sql> set pagesize 0 <ret>

C) sql> airflow1 <ret>

D) sql> quit <ret>

c:\air>

5) Type data file and check to see that it is there.

A) c:\air> Type airMMYY.dat|more <ret>

(airMMYY.dat is the filename in step 7.0,2,C)

8.0 PROCEDURE TO TRANSFER AIRFLOW DATA SET FROM THE PC TO THE VAX

1) Connect to VAX through SMARTERM

2) After Connecting to the VAX, Type the following:

A) $ @sys$system:kermit_pc2vax <ret>

B) Name of VAX file ? airMMYY.dat <ret>

(Filename is the same as in the previous procedure, step 2.)

C) What type of data file ? A <ret>

(The screen will go into capture mode)

D) File to be captured c:\air\airMMYY.dat <ret>

(You will have to hit enter a couple of times. Then file will transmit.)

9.0 PROCEDURE TO CREATE AIRFLOW SAS DATA SETS FROM ORACLE ASCII DATA SET, TO BE USED IN 'PLUCAL.PGM'

1) Edit 'Air_flow.sas'. Change filenames and dates.

A) $ Edit Air_flow.sas <ret>

B) * C

(The following is a listing of the program. Underlined areas need to be changed.)

LIBNAME ENVIRON '[R517089]';

C) FILENAME AIR 'AIRmmyy.DAT'; (mm=Month, yy=Year)

D) The following are for onsite data:

(ww = 2 digit week code, yy = 2 digit year code.)

1) %LET ODSN1=ENVIRON.OAWKwwyy; (1st 2-week period)
2) %LET ODSN2=ENVIRON.OAWKwwyy; (2nd 2-week period)
3) [1]*%LET ODSN3=ENVIRON.OAWKwwyy; (3rd 2-week period)

(mm = 1 or 2 digit month code, dd = 2 digit day,
yy = 2 digit year code.)

4) %LET ODATE1=MDY(mm,dd,yy);
(Start of the 1st 2-week period)
5) %LET ODATE2=MDY(mm,dd,yy);
(Start of the 2nd 2-week period)
6) %LET ODATE3=MDY(mm,dd,yy);
(End of the 2nd 2-week period)
7) [1]*%LET ODATE4=MDY(mm,dd,yy);
(End of the 3rd 2-week period)

[1] If this is a 3 week sampling period, then delete the star and fill in underlined areas, otherwise the star needs to be in front of these lines to comment it out.

E) The following are for perimeter data:

(ww = 2 digit week code, yy = 2 digit year code.)

1) %LET PDSN1=ENVIRON.PAWKwwyy; (1st 2-week period)

2) %LET PDSN2=ENVIRON.PAWKwwyy; (2nd 2-week period)

3) 2*%LET PDSN3=ENVIRON.PAWKwwyy; (3rd 2-week period)

(mm = 1 or 2 digit month code, dd = 2 digit day,
yy = 2 digit year code.)

4) %LET PDATE1=MDY(mm,dd,yy);
(Start of the 1st 2-week period)

5) %LET PDATE2=MDY(mm,dd,yy);
(Start of the 2nd 2-week period)

6) %LET PDATE3=MDY(mm,dd,yy);
(End of the 2nd 2-week period)

7) 2*%LET PDATE4=MDY(mm,dd,yy);
(End of the 3rd 2-week period)

2 If this is a 3 week sampling period, then delete the star and fill in underlined areas, otherwise the star needs to be in front of these lines to comment it out.

F) The following are for community data:

(ww = 2 digit week code, yy = 2 digit year code.)

1) %LET CDSN1=ENVIRON.CAWKwwyy; (1st 2-week period)

2) %LET CDSN2=ENVIRON.CAWKwwyy; (2nd 2-week period)

3) [3]*%LET CDSN3=ENVIRON.CAWKwwyy; (3rd 2-week period)

(mm = 1 or 2 digit month code, dd = 2 digit day,
yy = 2 digit year code.)

NOTE: The airflow for the community samplers are measured on two different days, so there can be 2 days for the start of each 2-week period. Also, 2 days for the end of each 2-week period. The program takes this into account.

4) %LET CDATE1=MDY(mm,dd,yy);
(First Day of the Start of the 1st 2-week period)

5) %LET CDATE2=MDY(mm,dd,yy);
(First Day of the Start of the 2nd 2-week period)

6) %LET CDATE3=MDY(mm,dd,yy);
(Second Day of the Start of the 2nd 2-week period)

7) %LET CDATE4=MDY(mm,dd,yy);
(First Day of the Start of the 3rd 2-week period)

8) %LET CDATE5=MDY(mm,dd,yy);
(Last Day of the End of the 2nd 2-week period)

9) [3]*%LET CDATE6=MDY(mm,dd,yy);
(Last Day of the End of the 3rd 2-week period)

[3] If this is a 3 week sampling period, then delete the star and fill in underlined areas, otherwise the star needs to be in front of these lines to comment it out.

```
DATA AIR;
INFORMAT SAMPLER $ 5.;
INFORMAT DATE1 DATE2 DATE3 DATE10.;
INFILE AIR;
INPUT SAMPLER DATE1 TIME1 FLOW1 DATE2 TIME2
        FLOW2 DATE3 TIME3 FLOW3 @;
```

G) DATA &ODSN1 &ODSN2 &PDSN1 &PDSN2 &CDSN1 &CDSN2[4];

[4] Include&ODSN3 - if 3rd 2-week sampling period for onsite samplers, &PDSN3 - if 3rd 2-week sampling period for perimeter samplers, and&CDSN3 - if 3rd 2-week sampling period for community samplers.

```
SET AIR;
IF (SAMPLER>='S-01' AND SAMPLER<='S-25') OR SAMPLER>'S-80' THEN
DO;
IF DATE1>=&ODATE1 AND DATE3<=&ODATE2 THEN OUTPUT &ODSN1;
IF DATE1>=&ODATE2 AND DATE3<=&ODATE3 THEN OUTPUT &ODSN2;
```

H) [5]*IF DATE1>=&ODATE3 AND DATE3<=&ODATE4 THEN OUTPUT &ODSN3;

[5] If this is a 3 week sampling period, then delete the star, otherwise the star needs to be in front of this line to comment it out.

```
IF (SAMPLER>='S-31' AND SAMPLER<='S-44') THEN DO;
IF DATE1>=&PDATE1 AND DATE3<=&PDATE2 THEN OUTPUT &PDSN1;
IF DATE1>=&PDATE2 AND DATE3<=&PDATE3 THEN OUTPUT &PDSN2;
```

I) [6]*IF DATE1>=&PDATE3 AND DATE3<=&PDATE4 THEN OUTPUT &PDSN3;

[6] If this is a 3 week sampling period, then delete the star, otherwise the star needs to be in front of this line to comment it out.

```
IF (SAMPLER>='S-51' AND SAMPLER<='S-75') THEN DO;
IF DATE1>=&CDATE1 AND DATE3<=&CDATE3 THEN OUTPUT &CDSN1;
IF DATE1>=&CDATE2 AND DATE3<=&CDATE5 THEN OUTPUT &CDSN2;
```

J) [7]*IF DATE1>=&CDATE4 AND DATE3<=&CDATE6 THEN OUTPUT &CDSN3;

[7] If this is a 3 week sampling period, then delete the star, otherwise the star needs to be in front of this line to comment it out.

K) <ctrl> Z

L) * EXIT

10.0 PROCEDURE FOR RETRIEVING DPM/ERROR DATA FROM THE R.H. LAB

1) While connected to the VAX, copy data from the R.H. lab.

$ Copy GEM1:[BRENT.PRESTATE]HPURPT(mm).SSD HPURPT(mm).SSD
(mm = the 2 digit month code)

11.0 PROCEDURE FOR CREATING AN ASCII LAB DATA SET TO TRANSFER TO ORACLE

1) Edit 'Plut_raw.sas' program. Change filename.

A) $ Edit Plut_raw.sas <ret>

B) * C

(The following is a listing of the program. Underlined areas need to be changed.)

LIBNAME ENVIRON '[R517089]';

C) FILENAME PLUT 'PLUT_mmm.DAT[1]'; (mmm=3 charac. month code)

DATA _NULL_;

D) SET ENVIRON.HPURPTmm[2]; (mm = 2 digit month code)

```
INFORMAT SAMPLER $ 5.;
SAMPLER=LOCATION;
IF LOCATION='S-1' THEN SAMPLER='S-01';
IF LOCATION='S-2' THEN SAMPLER='S-02';
IF LOCATION='S-3' THEN SAMPLER='S-03';
IF LOCATION='S-4' THEN SAMPLER='S-04';
IF LOCATION='S-5' THEN SAMPLER='S-05';
IF LOCATION='S-6' THEN SAMPLER='S-06';
IF LOCATION='S-7' THEN SAMPLER='S-07';
IF LOCATION='S-8' THEN SAMPLER='S-08';
IF LOCATION='S-9' THEN SAMPLER='S-09';
FILE PLUT;
PUT SAMPLER DATEON DATEOFF PU239 PU239ERR
PU238 PU238ERR;
RETURN;
```

E) <ctrl> Z

F) * EXIT

[1] ASCII Lab data set name to transfer to Oracle.

[2] SAS data set retrieved from the R.H. Lab.

12.0 PROCEDURE TO TRANSFER PLUTONIUM DATA SET FROM THE VAX TO THE PC

1) After Connecting to the VAX, Type the following:

A) $ @sys$system:kermit_vax2pc <ret>

B) Name of VAX file ? Filename <ret>

(Filename is the name of the file you want to transfer to the PC.)

C) What type of data file ? A <ret>

(The screen will go into capture mode)

D) Where file is to be transmitted
c:\air\filename <ret>

(Filename is the name you want to call the PC file that you are creating.)

(You will have to hit enter a couple of times. Then file will transmit.)

13.0 PROCEDURE FOR CREATING SAS DATA SET TO BE USED IN SAS 'PLUCAL.PGM' ON THE VAX.

1) Edit 'Plut_cal.sas'. Change the filenames.

A) $ Edit Plut_cal.sas <ret>

B) * C

(The following is a listing of the program. Underlined areas need to be changed.)

LIBNAME ENVIRON '[R517089]';

C) %LET DSN1=PLUmmmyy[1];

(mmm = 3 character month code, yy = 2 digit year code)

D) FILENAME PLU 'PLUT_mmm.DAT[2]';

DATA ENVIRON.&DSN1;
INFILE PLU;
INPUT SAMPLER $ DATEON YYMMDD7. DATEOFF
YYMMDD7. PU239
PU239ERR PU238 PU238ERR;

PROC PRINT DATA=ENVIRON.&DSN1;

FORMAT DATEON DATEOFF MMDDYY8.;

E) TITLE 'PLUTONIUM DATA FOR month year';

(month = name of month, year = 4 digit year)

F) <ctrl> Z

G) * EXIT

[1] SAS data set to be used in 'Plucal.pgm'.

[2] ASCII Lab data set created to transfer to Oracle.

14.0 PROCEDURE for PLUTONIUM CALCULATION PROGRAM

1) $ EDIT PLUCAL.PGM (This edits the plutonium calculation program)
C

2) SET UP DATA TABLE WITH THE FOLLOWING INFORMATION:

FILENAME PLUT 'OJUL90.DAT'; • First character: O, P, or C for ONSITE, PERIMETER, or COMMUNITY.

• 2-4 Characters: 3-letter abbr for month
• 5-6 Characters: Year
• 7-10 Characters: .DAT

%LET SITE = Location of Sampler; • ONSITE, PERIMETER, or COMMUNITY.

%LET MONTH=Month of reported data;

• Example: JULY

%LET DATES=Sampling Interval;

• Example: (5/29/90-6/26/90)

%LET DSN1=ENVIRON.OAWK2390; • Dataset for first 2-week interval

%LET DSN2=ENVIRON.OAWK2590; • Dataset for second 2-week interval

%LET DSN3=ENVIRON.CALNOV90; • Calibration data from most recent calibration

%LET DSN4=ENVIRON.CALJUN90; • Calibration data from previous calibration

%LET DSN5=ENVIRON.Plutonium dataset;

Example: ENVIRON.PLUMMYY;

%LET DSN6=Plutonium Calculation dataset for month;

• First Character: specify O, P, or C

• 2-4 Characters: CPU

• 5-(6) Characters: Number of Month

• 6(7)-7(8) Characters: Year

• Example: ENVIRON.OCPU790;

3) Hit the CONTROL key and the Z key at the same time.

4) EXIT

5) NOTE: UNDERLINED WORDS ARE FOR DEMONSTRATION PURPOSES ONLY

6) NOTE: THE PLUTONIUM CALCULATION PROGRAM (PLUCAL.PGM) IS ONLY USED WHEN DATA FALLS IN A TWO BIWEEKLY INTERVAL SCHEDULE.

15.0 PROCEDURE for PLUTONIUM CALCULATION- THREE PROGRAM

1) **$ EDIT PLUCAL3.PGM (edits the plutonium calculation program)**

   C

2) SET UP DATA TABLE WITH THE FOLLOWING INFORMTION:

   FILENAME PLUT '<u>OJUL90.DAT</u>'; * First character: O, P, or C for ONSITE, PERIMETER, or COMMUNITY.

   * 2-4 Characters: 3-letter abbr for month
   * 5-6 Characters: Year
   * 7-10 Characters: .DAT

   %LET SITE=<u>Location of Sampler;</u> * ONSITE, PERIMETER, or COMMUNITY.

   %LET MONTH=<u>Month of reported data;</u>

   * Example: JULY

   %LET DATES=<u>Sampling Interval;</u>

   * Example: (5/29/90-6/26/90)

   %LET DSN1=ENVIRON.<u>OAWK2390;</u>

   * Dataset for first 2-week interval

   %LET DSN2=ENVIRON.<u>OAWK2590;</u>

   * Dataset for second 2-week interval

   %LET DSN7=ENVIRON.<u>OAWK2790;</u>

   * Dataset for third 2-week interval

%LET DSN3=ENVIRON.CALNOV90;

* Calibration data from current quarter

%LET DSN4=ENVIRON.CALJUN90;

* Calibration data from previous quarter

%LET DSN5=ENVIRON.Plutonium dataset;

Example: ENVIRON.PLUMMYY;

%LET DSN6=Plutonium Calculation dataset for month;

* First Character: specify O, P, or C
    * 2-4 Characters: CPU
    * 5-(6) Characters: Number of Month
    * 6(7)-7(8) Characters: Year
    * Example: ENVIRON.OCPU790;

3) Hit the **CONTROL** key and the **Z** key at the same time.

4) **EXIT**

5) NOTE: UNDERLINED WORDS ARE FOR DEMONSTRATION PURPOSES ONLY

6) NOTE: THE PLUTONIUM CALCULATION-THREE PROGRAM (PLUCAL3.PGM) IS ONLY USED WHEN DATA FALLS IN A THREE BIWEEKLY INTERVAL SCHEDULE.

16.0 PROCEDURE for CREATING a SAS FILE for PLUTONIUM CALCULATION

1) **SAS PLUCAL.PGM**

2) Check PLUCAL.PGM for errors:

   EXAMPLE: $TYPE PLUCAL.LOG

3) If error messages occur, read the messages by going to:
   $EDIT PLUCAL.LOG

   A) Correct errors per log.

   B) Recreate SAS file.
   SAS PLUCAL.PGM

   C) Check PLUCAL.PGM again for errors as in number 2 above.

4) If no errors occurred or errors were corrected proceed with program.

5) TYPE NAME OF FILE IN PLUCAL.PGM ASSOCIATED WITH FILENAME IN STEP 8.0 No. 2

   EXAMPLE: TYPE OJUL90.DAT

   A) If numbers look wrong, check the .LIS file to find mistakes.

EXAMPLE: $TYPE PLUCAL.LIS

B) If errors still occur in data, edit dataset files and run data. Check data sets for syntax, order, spelling, and correct files errors.

EXAMPLE:. EDIT OAWK1990.SAS

C) **SAS PLUCAL.PGM.**

D) TYPE PLUCAL.LIS (to recheck numbers)

6) If numbers are good you can print if you want, it is a large file .

7) To print the data for the monthly reports, send the file to the PC and print it before you run the program for the next location.

EXAMPLE: OJUL90.DAT

8) **PERFORM ALL STEPS FOR ONSITE, PERIMETER, AND COMMUNITY DATA!**

9) <u>NOTE: UNDERLINED WORDS ARE FOR DEMONSTRATION PURPOSES ONLY</u>

17.0 PROCEDURE for CALIBRATION DATA (BIANNUAL DATA FROM THE PML, MUST BE ENTERED PRIOR TO RETRIEVING LAB DATA)

1) **$ EDIT CAL/MONTH/YEAR.SAS;**

(same as step 2.0 No. 2, DSN3 with SAS added)

EXAMPLE: CALAPR90.SAS;

2) C

3) LIBNAME ENVIRON. '[R + EMPLOYEE BADGE NUMBER]';

4) DATA ENVIRON.CALMONTH;

EXAMPLE: DATA ENVIRON.CALAPR;

5) INPUT SAMPLER$ DATE1 X Y;

6) CARDS;

7) EXAMPLE: (enter the sampler number, calibration date, the x value and y value)

S-01 901026 960 988 (sampler S-01 was calibrated on Oct. 26th, 1990)
S-01 901026 920 938
S-01 901026 883 886
S-01 901026 830 832
S-01 901026 787 775
S-01 901026 743 714
S-01 901026 687 645

7) ; (; - ALWAYS AT THE END OF DATA)

8) REPEAT FOR ALL AMBIENT AIR SAMPLERS

DATA ENVIRON.S81/MONTH/YEAR;

INPUT SAMPLER$ DATE1 XY; (X and Y are the slope and intercept respectively)

EXAMPLE:S81A 900411 1.345 2.156

9) PROC PRINT DATA=ENVIRON.CALMONTH;

EXAMPLE: PROC PRINT DATA=ENVIRON.CALAPR;

10) TITLE 'AIR CALIBRATION DATA FROM MONTH - YEAR';

EXAMPLE:

TITLE 'AIR CALIBRATION DATA FROM JUNE - 1990';

11) PROC PRINT DATA=ENVIRON.S81MMYY; FOR THE TEMPORARY AIR SAMPLERS

12) TITLE 'AIR CALIBRATION DATA FOR S-81 FROM MONTH- YEAR';

EXAMPLE:

TITLE 'AIR CALIBRATION DATA FOR S-81 FROM JUNE -1990';

13) HIT CONTROL KEY AND Z KEY AT THE SAME TIME

14) EXIT

18.0 PROCEDURE for CALIBRATION CALCULATION PROGRAM

PROGRAM - CALIBRAT.PGM - CALIBRATION PROGRAM

1) EDIT CALIBRAT.PGM

2) C

3) %LET DSN1=ENVIRON.CAL<u>MAY</u>;
/*CALIBRATION DATA FOR SAMPLERS*/
ROUTINE NETWORK ONLY(the month should be the same as in step 11 No. 3)
%LET DSN2=ENVIRON.S<u>**81mmyy**</u>; /*CALIBRATION DATA FOR SAMPLER*/
TEMPORARY NETWORK ONLY (this mm yy is the same as in step 11 No. 8)
%LET DSN3=ENVIRON.CAL<u>MAY90</u>; /*CALIBRATION DATA SET FOR CURRENTQUARTER*/ (the month must be the same as in DSN1 above)
/*CHARACTERS 1-3: CAL*/
/*CHARACTERS 4-6: 3 LETTERS FOR MONTH*/
/*CHARACTERS 7-8: YEAR*/

4) CONTROL Z

5) EXIT

19.0 SAS CALIBRAT.PGM

A) review CALIBRAT.LOG for mistakes

20.0 GENERAL NOTES on the SAS PROGRAM

1) SAS starts compiling data when H&S file is put into SAS dataset

2) After data is compiled check the LOG file for notes and error messages before proceeding into the program.

3) The monthly chart is printed from the FILENAME.SAS.
EXAMPLE: OAWK2690.SAS

4) LIS file gives raw data.

5) PROC PRINT=sets up the listed data.

21.0 PROCEDURE FOR CREATING AN ASCII CALIBRATION DATA SET TO TRANSFER TO ORACLE.

1) Edit 'Cali_cal.sas'. Change filenames.

A) $ <u>Edit Cali_cal.sas</u> <ret>

B) * <u>C</u> <ret>

(The following is a listing of the program. The underlined areas need to be changed.
LIBNAME ENVIRON '[R517089]';

C) FILENAME CAL '<u>CALI_mmm.DAT</u>';
(mmm=3 character month)

DATA _NULL_;

D) SET ENVIRON.CALmmmyy[2];

(Calibration Data Set)

(mmm = 3 character month, yy = 2 digit year)

```
INFORMAT DATE3 YYMMDD6.;
RENAME DATE1=DATE3;
FILE CAL;
PUT @1 SAMPLER @7 DATE3 DATE7. @20 M @30 B;
RETURN;
```

E) <ctrl> Z <ret>

F) * exit <ret>

[1] ASCII Calibration data set created to transfer to Oracle.

[2] SAS Calibration data set wanting to send to Oracle.

MASS FLOW TSP/PM_{10} CALIBRATION, AMBIENT AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

EG&G ROCKY FLATS PLANT	Manual:		5-21000-OPS
EMD MANUAL OPERATION SOP	Procedure No.:		AP.11, Rev. 0
CONTROLLED DOCUMENT			
	Effective Date:		October 1, 1991
Category EG&G — ROCKY FLATS PLANT	Organization:		Environmental Management
ENVIRONMENTAL MANAGEMENT DEPARTMENT			

This is a RED Stamp

TITLE:
MASS FLOW TSP/PM_{10} CALIBRATION, AMBIENT AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

Approved By: Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

This procedure will establish and document the requirements and responsibilities for calibration of the mass flow controlled (MFC) total suspended particulate (TSP) and particulate matter with an aerodynamic diameter smaller than or equal to 10 microns (PM$_{10}$) air samplers used at Rocky Flats Plant (RFP).

The purpose of the monitoring program is to quantify the concentrations of ambient particulates present during characterization and restoration activities at the investigation sites. Data may be used to address baseline risk assessment as well as environmental concerns. It's imperative that data be of high quality and totally defensible through proper record keeping and adherence to accepted methodologies, regulations, and guidelines.

3.0 RESPONSIBILITIES AND PROGRAM SUPPORT

Air sampling is performed pursuant to an Inter-Agency Agreement (IAG) among the Department of Energy (DOE), Colorado Department of Health (CDH), and the U.S. Environmental Protection Agency (EPA). These agreements stem from health and safety concerns for employees working on the project as well as the general public.

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Program manager is responsible to insure all particulate air sampling is performed in compliance with approved procedure and specific OU work plan when applicable. Calibrations and maintenance activities are required at specified intervals. The program manager is responsible for completion and coordination of the following items:

1) Schedule Sampler Calibration,
2) Review Calibration Worksheets.

3.2 MAINTENANCE SUPPORT

Environmental Management Department (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform routine maintenance activities. Prior to field calibration activity, the sampler motors are replaced. Other maintenance problems and issues require submission of RFP work request forms. Maintenance support is provided by Building 334 maintenance personnel. All maintenance is performed in accordance with procedure Number AP.12, Maintenance Procedure for RFP TSP HiVol Air Sampler.

3.3 AIR SAMPLER CALIBRATION

Technicians from the RFP Meterology Standards Laboratory perform multipoint calibrations on all samplers to characterize the flow capabilities of each sampler. All calibrations are executed using a transfer standard traceable to the National Institute of Standards and Technology (NIST). All samplers require quarterly calibration in accordance with procedures contained in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.11.0, Reference Method for the Determination of Particulate Matter in the Atmosphere (High Volume PM_{10} Sampler Method), Revised November 1989, EPA-600/4-77-027a.

3.3.1 Calibration Assumptions

In this section, the following conditions are assumed:

- The sampler uses a mass flow controller to control actual sample flow rate.

- Flow rate is measured by measuring the exit orifice plenum pressure using an oil or water manometer.

- Transfer standard for flow rate calibration is equipped with either a series of resistance plates or an intregal variable resistance valve.

- The sampler is calibrated in actual volumetric flow-rate units (Qa). The orifice transfer standard is also calibrated in Qa.

3.3.2 On-Site Calibration Requirement

Calibration of some MFC samplers may be affected by changes in line voltage, particularly if the line voltage is below normal (115 volts AC). For this reason, MFC samplers are always calibrated at the monitoring site.

4.0 REFERENCES

4.1 SOURCE REFERENCES

CFR Title 40, Part 50, Appendix B. Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method).

U.S. Environmental Protection Agency, 1976. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II Ambient Air Specific Methods.EPA-600/4-77-027a.

Andersen Samplers, Inc., Operators and Instruction Manual, PM_{10} High-Volume Air Sampler System.

4.2 INTERNAL REFERENCES

- SOP AP.12, Maintenance Procedure for RFP TSP HiVol Air Sampler.

- SOP AP.16, Restoration Programs Radioactive Air Particulate Sampling High Volume Method.

- SOP AP.09, Ambient TSP and PM_{10} Air Particulate Sampling, High Volume Method

5.0 OPERATIONAL PROCEDURES

This document provides a step-by-step procedure for calibration of MFC TSP or PM_{10} particulate samplers. All procedures should be followed in the order presented. Calibration procedures are referenced to the manufactures instructions, as well as the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.11.0, Reference Method for the Determination of Particulate Matter in the Atmosphere (High Volume PM_{10} Sampler Method), Revised November 1989, EPA-600/4-77-027a.

- The calibration technician should read these procedures thoroughly and become familiar with the sampler prior to beginning calibration.

- The following equipment and materials are required for calibration of the samplers.

  - Calibration Orifice Transfer Standard with NIST Traceability,

- Calibration Orifice Resistance Plates,
- Rubber Stopper or Duct Tape,
- Water or Oil Manometer with a 0 to 16-inch Range for Orifice Pressure Measurements,
- Water or Oil Manometer with a 0 to 8-inch Range for Sampler Exit Orifice Plenum Pressure Measurement,
- Thermometer with a 0° to 50°C Range, Accurate to ±1°C,
- Aneroid Barometer with a Range of 500 to 800 mm Hg and Accurate to ±5 mm Hg,
- Calibration Data Sheets,
- Clean Filters.

NOTE: Do not calibrate the sampler during windy conditions. The calibration will be less precise due to pressure variations associated with wind fluctuations.

5.1 PRE-CALIBRATION PROCEDURE

5.1.1 Calibration System Setup

The following procedure provides step by step instructions for proper set-up of the calibration system.

1) Install a clean filter on the filter cartridge.

2) Install the orifice baseplate on the filter cartridge.

3) Install the calibration orifice on the baseplate.

4) Tighten the faceplace nuts evenly on alternating corners to properly align and uniformly seat the gaskets. **The nuts should be hand tightened only; too much compression may damage the sealing gaskets.**

5) Connect the eight-inch manometer to the sampler's exit orifice.

5.1.2 Calibration System Leak Test

The following section provides a simple procedure for testing the integrity of the calibration system prior to starting calibration.

1) Block the orifice with a rubber stopper or duct tape.

2) Seal the orifice pressure port with a stopper or tape.

3) Turn on the sampler. **To avoid overheating the sampler motor do not operate for more than 30 seconds with orifice blocked. This can damage the motor.**

4) Gently rock the orifice standard and listen for a whistling sound that would indicate crossthreading of the orifice to the baseplate, or unevenly tightened faceplate nuts. A leak-free system will not produce any upscale readings on the exit orifice manometer. All leaks must be eliminated before proceeding with the calibration.

5) Turn off sampler and unblock the calibration orifice.

5.2 CALIBRATION

The information provided in this section should be followed closely and performed in the order listed. This section details the actual calibration activity. Minor errors in reading instruments and recording data at this stage may introduce profound uncertainty regarding data validity.

1) Inspect the manometer tubing for crimps or cracks. Open the manometer valves and gently blow through the tubing, watch for the fluid in the manometer flow.

2) Adjust the manometers' sliding scales so the zero lines are at the bottom of the meniscuses.

3) Connect the transfer standard manometer to the orifice. Ensure that one side of each manometer is open to the atmosphere. Make sure the tubing fits snugly on the pressure taps and on the manometers.

4) Read and record the following information on the calibration data sheet (Form AP.11A).

   a) Date, Location, and Operators Signature,
   b) Sampler Serial Number and Model,
   c) Ambient Barometric Pressure (Pa), mm HG,
   d) Ambient Temperature (Ta), °C and K (K= °C + 273),
   e) Orifice Serial Number and Calibration Relationship.

5) Disconnect the sampler motor from the flow controller and plug it directly into a stable line voltage source.

6) Turn on the sampler and allow it to warm up to operating temperature (three to five minutes).

7) Read and record the orifice transfer standard's manometer reading on the calibration data sheet in the delta H_2O column.

8) Read the samplers exit orifice pressure manometer reading in inches H_2O. Record on the calibration data sheet in the delta Pex H_2O column.

9) Generate at least four additional flows by inserting the orifice resistance plates or adjusting the variable orifice. For each flow generated, repeat step 6 and 7 and record the results on the calibration data sheet.

10) Calculate and record the transformed sampler manometer reading as delta Pext;

delta Pext = [delta Pex(Ta+30)/Pa]$^{1/2}$

where:

delta Pext = Transformed Manometer Reading

delta Pex = Sampler Manometer Reading, Inches H_2O

Ta = Ambient Temperature, K (K = °C + 273)

Pa = Ambient Barometric Pressure, mm Hg

11) On a sheet of graph paper, plot the calculated orifice transfer standard's flow rates, Qa (orifice), on the x-axis vs the transformed sampler manometer reading on the y-axis. Draw a curve through the plotted data.

Note: The data should be plotted in the field at the time of calibration. Re-run any calibration points that vary by more than 10 percent from the ideal slope for the calibration curve.

12) Turn off the sampler and remove the orifice transfer standard.

13) Reconnect the sampler motor to the flow controller.

5.2.1 Calibration Calculations

All calibration data should be collected, including the orifice calibration information and the sampler calibration data sheet.

Note: These calculations should be performed at the time of calibration. The data will be used to set the mass flow controller to a value that will result in optimal volumetric flow based on seasonal average temperature and pressure at the monitoring site.

1) Verify the orifice transfer standard calibration is current and traceable to a primary standard.

2) Calculate and record Qa (orifice) for each calibration point from the orifice calibration information and the following equation:

$$Qa\ (orifice) = \{[delta\ H_2O(Ta/Pa)]^{1/2} - b\}\ \{1/m\}$$

Where:

Qa (orifice) = Actual Volumetric Flow Rate as Indicated by the Transfer Standard Orifice, m^3/min

delta H_2O = Pressure Drop Across the Orifice, Inches H_2O

Ta = Ambient Temperature during Calibration, degrees K (K = °C + 273)

Pa = Ambient Barometric Pressure during Calibration, mm Hg

b = Intercept of the Orifice Transfer Standard's Calibration Relationship

m = Slope of the Orifice Transfer Standard's Calibration Relationship

3) Calculate and record the transformed sampler manometer reading as delta Pext

delta Pext = [delta Pex(Ta+30)/Pa]$^{1/2}$

Where:

delta Pext = Transformed Manometer Reading

delta Pex = Sampler Manometer Reading, inches H_2O

Ta = Ambient Temperature, K (K = °C + 273)

Pa = Ambient Barometric Pressure, mm Hg

4) On graph paper , plot the calculated orifice transfer standard's flow rates, Qa (orifice), on the x-axis vs the transformed sampler manometer response, delta Pext on the y-axis. Draw a curve through the plotted data.

Note: Because the determination of the sampler's average operational flow rate (Qa) during a sample period depends on the ambient average temperature and pressure, use of a graphic plot of the calibration relationship is not recommended for subsequent data deduction. This plot is used only to visually assess the calibration points to see if any should be rerun.

5) Plot the regression line on the same graph paper as the calibration data. For the regression model y = mx + b. Let y = delta Pext, and x = Qa(orifice) so that the model is given by:

delta Pext = m[Qa(orifice)] + b

Using a programmable calculator, determine the linear regression slope (m), intercept (b), and correlation coefficient (r). Record them on the calibration data sheet. A five-point calibration should yield a regression equation with an $r > 0.999$, with no point deviating more than ± 0.04 m^3/min from the value predicted by the regression equation.

6) For subsequent sample periods, the sampler's average actual operational flow rate is calculated from the calibration slope and intercept using the following equation:

$$\overline{Qa} = \{[\overline{\text{delta Pex}}(Tav+30)/Pav]^{1/2} - b\}\ \{1/m\}$$

Where:

$\overline{Qa}$ = the Sampler's Average Actual Flow Rate, m^3/min

$\overline{\text{delta Pex}}$ = Average of Initial and Final Sampler Manometer Readings (delta Pex_i + delta Pex_f)/2, Inches H_2O

Tav = Average Ambient Temperature for the Sample Period, K (K = °C + 273)

Pav = Average Ambient Pressure for the Sampling Period, mm Hg

b = Intercept of the Sampler Calibration Relationship

m = Slope of the Sampler Calibration Relationship

5.2.2 Mass Flow Controller Adjustment Procedure

Because the flow rate of a MFC sampler is adjustable, it must be set to the proper flow rate for the inlet. The constant mass flow maintained by the MFC causes the actual volumetric flow rate through the inlet to fluctuate as the ambient temperature and barometric pressure change at the site. Normally, the range of fluctuations is within the tolerance of the inlet. However, the flow rate set point of the mass flow controller must be correctly adjusted so the deviations are centered with respect to the seasonal average temperature and barometric pressure at the site. This does not include the temperature and pressure prevailing at the time of the setting. The correct volumetric setpoint flow rate (SFR) at ambient temperature (Ta) and ambient barometric pressure (Pa) has the same mass flow rate as the inlet design volumetric flow rate has at the seasonal average temperature (Ts) and pressure (Ps).

Note: The correct SFR may be different from day-to-day and be higher or lower than the inlet design on any particular day.

1) Determine the Ts and Ps at the site and record them on the calibration data sheet. This information is obtained from the EMAD Air Programs Group Climatologist and is based on data collected at RFP.

2) Calculate the SFR and record on the calibration data sheet.

$$SFR = (1.13)\ (Ps/Pa)\ (Ta/Ts)$$

Where:

SFR = Set-Point Actual Volumetric Flow Rate for Adjustment of the MFC, Based on Seasonal Average Temperature and Pressure, m^3/min

1.13 = Inlet Design Flow Rate m^3/min

Ps = Seasonal Average Barometric Pressure at the Site

Pa = Current Ambient Barometric Pressure at the Site

Ts = Seasonal Average Temperature at the Site, K

Ta = Current Ambient Temperature at the Site, K (K= °C + 273)

3) Calculate and record on the calibration data sheet, the set-point manometer reading that corresponds to the SFR calculated in Step 2.

$$SSP = [Pa/(Ta + 30)][m(SFR) + b]^2$$

Where:

SSP = Sampler Set Point Manometer Reading, Inches H_2O
Pa = Ambient Barometric Pressure, mm Hg
Ta = Ambient Temperature, K (K = °C + 273)
m = Slope of the Samplers Calibration Relationship
SFR = Set Point Flow Rate, m^3/min
b = Intercept of the Samplers Calibration Relationship

4) Check to make sure the motor is connected to the mass flow controller and the manometer is properly connected to the exit orifice tap.

5) Install a clean filter in the filter cassette and install on the sampler.

6) Turn on the sampler and allow it to operate three-to-five minutes to warm up to operating temperature.

7) Adjust the potentiometer in the MFC to achieve the manometer reading SSP calculated in Step 3.

8) Allow the sampler to run and verify the controller maintains this flow for at least 10 minutes.

9) Turn off the sampler.

10) The calibration is now complete. Prepare the sampler for the next sample run day.

MFC SAMPLER CALIBRATION DATA SHEET

Station Location ______________ Date ________ Time ____________

Sampler Model ____________ S/N ________ Operator ______________

Pa ______mm Hg, Ta ______°C ______K, Unusual Conditions:______________

Ps* ______mm Hg, Ts* ______°C ______K, (* Seasonal average Ta and Pa)

Orifice S/N ______________ Orifice Calibration Date ____________

Orifice calibration relationship: m = ________ b = ________ r = ________

Plate Number	Total ΔH_2O (in.)	X-Axis = Qa(orifice) flow rate[a] (m^3/min)	Sampler ΔPex (in. H_2O) [or I for flow recorders]	Y-Axis = Sampler ΔPext[b] [or It for flow recorders][c]

[a] $Qa = \{[(\Delta H_2O)(Ta/Pa)]^{1/2} - b\} \{1/m\}$

[b] $\Delta Pext = [\Delta Pex(Ta + 30)/Pa)^{1/2}$

[c] $It = [I] [(Ta + 30)/Pa]^{1/2}$ if a flow recorder is used

Sampler Calibration Relationship (Qa on x-axis; ΔPext or [It] on y-axis):

Δ Pext = m[Qa(orifice)] + b or It = m[Qa(orifice)] + b

m = ____________ b = ____________ r = ____________

For subsequent calculation of sampler flow rate:

Qa = $\{[\text{mean } \Delta Pex\ (Tav + 30)/Pav]^{1/2} - b\} \{1/m\}$

or Qa = $\{\text{mean } I[(Tav + 30)/Pav]^{1/2} - b\} \{1/m\}$

Set point flow rate (SFR) ______________

SFR = 1.13 (Ps/Pa) (Ta/Ts)

Sampler set Point (SSP) ______________

SSP = $[Pa/(Ta + 30)] [m(SFR) + b]^2$

or SSP = $[Pa/(Ta + 30)]^{1/2} [m(SFR) + b]$ for flow recorders

EG&G ROCKY FLATS PLANT	Manual:	5-21000-OPS
EMD MANUAL OPERATION SOP	Procedure No.:	AP.13, Rev. 0
	Page:	1 of 50
	Effective Date:	October 1, 1991
Category 2	Organization:	Environmental Management

TITLE:
RADIOACTIVE AMBIENT AIR MONITORING PROGRAM

Approved By: Ralph Porter 10/8/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

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2.0 PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) establishes and documents the requirements and responsibilities for routine radioactive ambient air sampling at the Rocky Flats Plant (RFP).

The purpose of the Radioactive Ambient Air Monitoring Program (RAAMP) is to pursue the requirements and responsibilities for routine radioactive ambient air sampling at the RFP. The focus of RAAMP is directed toward collection of air data, documentation and mathematical evaluation of that data, and production of environmental reports. The ambient air monitoring program is continually upgraded at RFP to improve the existing network. The end result is to ensure that high quality data, documentation, and reports are able to withstand intense scientific, regulatory, legal, and public scrutiny. The scope of the RAAMP undertaking is environmental surveillance reporting and compliance. This document outlines the steps required to maintain routine particulate sampling of ambient air for radiation at RFP.

This monitoring program has been in operation since the early 1970s. The Colorado Department of Health (CDH) monitors a similar, independent network of radioactive air samplers at RFP and in adjacent community locations. Data from the RFP and CDH monitoring programs are reported at a monthly public meeting. These public meetings have been ongoing since the beginning of the program.

This procedure contains descriptions of air sampler operation and filter exchange, filter preparation for analysis, RAAMP documentation and reporting requirements.

3.0 RESPONSIBILITIES AND QUALIFICATIONS

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Programs Manager of the RFP Environmental Management Department (EMD) directs the RAAMP Manager, who, in turn, directs Environmental Monitoring and Assessment Technologists (EMATs). These technologists monitor and maintain 53 air samplers that are designed to detect radioactive particles in ambient air at the plant site and in nearby communities.

The RAAMP Manager is responsible for maintaining compliance with the environmental protection requirements contained in DOE Order 5400.1: "General Environmental Protection Program." The RAAMP Manager must meet requisite reporting obligations specified in DOE Order 5484.1: "Environmental Protection, Safety, and Health Protection Information Reporting Requirements." Compliance of DOE Orders 5408.1B, and 5700.6B must also be demonstrated.

The Program Manager is responsible for completion and coordination of the following items:

- Prepare a monthly ambient air report for inclusion in the RFP Monthly Environmental Monitoring Report.
- Prepare an annual ambient air report for inclusion in the RFP annual report.
- Provide technical clarifications to regulators and the public through the Monthly Data Exchange Meetings, held in conjunction with CDH.
- Prepare status reports for routine and special ambient air sampling efforts including the results of data reduction and statistical analysis for the monthly report.

- Compile perimeter and community ambient air plutonium concentration data for calculation of the air pathway contribution to the annual plant-related radiation dose assessment for the public.

- Compile onsite ambient air plutonium concentration data to be included as the contribution from diffuse sources when computing an air pathway-only radiation dose equivalent resulting from plant operations as determined through emissions data and the AIRDOS-EPA model.

- Schedule weekly air sampler inspection, biweekly air sampler filter collection, required sampler maintenance, air sampler calibrations and purchase all supplies required for the RAAMP air sampler operation and sample collection.

- Screen the analytical results from Radiological Health Laboratories (RHL) and indicate when a repeat analysis is required.

- Calculate the air sample volume data with the sampler calibration information provided by the RFP Physical Metrology Laboratory.

- Conduct audits of RAAMP operations to determine compliance to procedures.

3.2 ENVIRONMENTAL MONITORING AND ASSESSMENT TECHNOLOGIST'S (EMAT'S) DUTIES

The EMAT's main responsibilities are to record data and change filters on each RAAMP air monitoring sampler. This is a three-step process performed over a two-week period. Initially, a filter is installed and airflow data are recorded for all samplers. One week after filter installation, the sampler is inspected by the EMAT who records airflow data and elapsed time. A week after this interim inspection, the filter in each sampler is taken out and prepared for analysis by the RH

Labs. A new filter is installed and initial airflow data for this new filter are recorded at this point, starting the two-week sampling cycle over. The full range of the EMATs duties and responsibilities follows:

- Collect biweekly ambient air sample filters and install new filters on 53 monitors located on plantsite, around the plant perimeter and in nearby communities. (The filter sample from each monitor is placed in its own prepared envelope and taken to RH Labs for analysis. Information including date, airflow, elapsed time and location is recorded on the envelope at the time of collection.)

- Conduct a weekly inspection of each air sampler and record data.

- Duplicate the data from each sample envelope sent to the RH Labs in the RAAMP field log.

- Report biweekly air sampling data to the RAAMP Manager.

- Maintain and calibrate the assigned Ludlum Model 12-1A radioactive particle sampling instrument.

- Report any unusual activity such as construction, earth moving, etc., that could affect sampling data to the Program Manager.

- Report to the Program Manager any needed maintenance on the assigned government vehicle.

- Perform additional air monitoring services on plantsite by operating portable equipment to check vehicles, equipment, roadways, soil, spills and shipments for contamination and radiation.

- Determine what is needed to contain and control the spread of radiation and radioactive or toxic contaminants from work performed by other plant personnel. This will be done at the direction of the Program Manager.

3.3 MAINTENANCE SUPPORT

Maintenance of the samplers will be performed by the maintenance group assigned to the area where the malfunctioning sampler is located. This must be done by submitting individual work requests.

Environmental Management and the RFP garage have agreed that the EMAT may change flat tires on the government vehicle assigned to the RAAMP. All other vehicle maintenance and repairs will be conducted by the RFP garage.

The EMAT must immediately report the maintenance requirement to the RAAMP Manager if a sampler requires repair or is vandalized.

3.4 AIR SAMPLER CALIBRATION

The Physical Metrology Standards Laboratory Personnel, in Building T690K, will perform biannual ambient air sampler calibrations. A calibration is done to compare National Institute of Standards and Technology (NIST) certified transfer standard readings with corresponding readings measured by the RAAMP sampler flow meter. The calibration is performed at original values throughout the entire range of the air sampler under proper temperature and wind speed conditions. Interim calibrations are performed on air samplers after maintenance is performed. All calibration data are reported to the RAAMP Manager. Step-by-step technical information is provided by procedure S-P-08003: "High Volume Air Sampler Calibration."

3.5 RADIOLOGICAL HEALTH LABS

The RH Labs Central Receiving area in Building 123 accepts the ambient air samples from the RAAMP EMAT. An exchange of custody form is signed upon RH receipt of filter samples (see Figure AP.13-1 and Form FO.14H [see back of this document]). The Central Receiving area also conducts the analysis of the filters. The samples are analyzed according to procedures HEA 0001-02: "Analysis of Plutonium on Variable Composite and High Dust Load Glass Fibre Filters" and procedure HEA 0019-01: "Analysis of Americium on Variable Composite and High Dust Load Glass Fibre Filters." Quality checks performed by the labs include duplicates, spikes, blanks, internal standards, and calibration standards. A plutonium disintegrations-per-minute (dpm) value is provided to the RAAMP Manager after the data have been reviewed by the appropriate lab personnel and have met the labs quality assurance limitations.

4.0 REFERENCES

4.1 SOURCE REFERENCES

Catalog of Monitoring Activities at Rocky Flats. Health, Safety, and Environmental Publication.

Analysis of Plutonium on Variable Composite and High Dust Load Glass Fiber Filters. HEA 0001, Health, Safety, and Environmental Procedure.

High Volume Air Sampler Calibration. S-P08003, Physical Metrology Laboratory Procedure.

HEALTH/ENVIRONMENT LABORATORY
ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY RECORD (AIR SAMPLES)

Project Description (No.)	Project Responsibility
Sampler(s): (Signature)	

Sample Type	Customer Identification	H/E Lab Number (By CRL)	Comp.	GRAB	Time (Milt.)	Date	Sample Location	Dis. Spl. Volume (ml)	Aligust Volume/Run No.			Plutonium (PHA)	Americium (PHA)	Uranium (PHA)	Uranium-Phosphorim	Tritium				Remarks

Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (signature)

Custody Record Page ________ of ________ Pages | Sample Batch No. ____________ | Reagent Nos. ____________

RF-47151 (4/87)

FIGURE AP.13-1

Performance Test and Operational Checks for Ludlum Models 12-1A and 31 Survey Instruments. Health, Safety Procedure.

Clean Air and Environmental Reporting Charter. G.H. Setlock, Manager.
Quality Assurance Program Plan, Environmental Restoration, Quality Control.

5.0 EQUIPMENT AND PROCEDURES

The high volume ambient air samplers in operation at RFP are designed to continuously monitor ambient air at and near RFP. Air coming in contact with a sampler is forced through a filter material, trapping radioactive particulates and other airborne matter for subsequent analysis. Ambient air analysis addressed by RAAMP is limited to radioactivity.

5.1 REGULATORY COMPLIANCE

Regulatory requirements affecting RAAMP are established by the following four principal groups:

- U.S. DOE Headquarters, Albuquerque Operations,and the Rocky Flats DOE Office
- EG&G Rocky Flats, Inc.
- U.S. EPA Region VIII Office, Denver
- CDH, Denver

Applicable DOE requirements affecting RAAMP are listed below:

- DOE Order 5400.1, General Environmental Protection Program (11-9-88)

- DOE Order 5400.5, Radiation Protection of the Public and the Environment (11-9-88)

- DOE Order 5480.1B, Environment, Safety, and Health Program for Department Operations (9-23-86)

- DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards (5-15-84)

- DOE Order 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements (2-24-81)

- DRAFT DOE Order 5400.XY, Radiological Effluent Monitoring and Environmental Surveillance (9-14-88)

- DOE Order 5700.6B, Quality Assurance (9-23-86)

- DOE-AL Order AL5700.6B, Quality Assurance

- DOE Order 6430.1, General Design Criteria (12-12-83)

5.2 OPERATIONAL PROCEDURE

Performance data from all RAAMP air samplers is collected by the EMAT on a weekly basis and air filters are exchanged every 2 weeks. This schedule is set by the Program Manager.

The tasks required of the EMAT in the weekly inspection include the following:

- Record airflow and elapsed time on RAAMP envelope and the RAAMP field log.
- Document any unusual observations concerning an air sampler or its location.
- Report to the RAAMP Manager the overall status of the sampling network.

The tasks required in the biweekly filter change are:

- Remove the used filter and seal it in its envelope.
- Install new filter.
- Collect airflow and elapsed time data.
- Observe maintenance of air sampler.
- Document any unusual observations concerning an air sampler or its location.
- Deliver filters to RH Labs.

The EMAT will submit a biweekly, handwritten observation log to the RAAMP Manager for data verification. The EMAT will immediately report observed flow rates of less than 0.5 m^3/min. to the RAAMP Manager for investigation of sampler.

5.2.1 **Inspection Route Procedure**

The EMAT will pick up the government vehicle at the Building T130B parking area before embarking on the air sampler route. Vehicle must be returned and kept in the T130B parking area when not in use.

The EMAT will have charge of the vehicle key. If the key is misplaced or lost the EMAT must notify the RAAMP Manager who will arrange for a replacement.

The ambient air program uses the Ludlum Model 12-1A sampling device to monitor the air samplers for radioactive alpha particulates. This is done at the Program Manager's direction. For operation of the Ludlum EMATs should refer to the procedure: "Performance Test and Operational Checks for Ludlum Models 12-1A and 31 Survey Instruments" available from the RAAMP Manager.

The Ludlum must be calibrated daily. Calibration test results will be recorded on a daily performance test log (see Figure AP.13-2 and Form AP.13A).

The EMAT will pick up the following supplies from Building T130B before each sampler inspection run:

- Protective identification envelopes
- S & S air filters
- RAAMP field log
- Thermometer

There are 53 RAAMP air samplers located on site, near the RFP perimeter and in nearby communities. Airborne particulates in ambient air are continuously collected on filters by these samplers. Filters are collected biweekly, grouped by location (onsite, perimeter, community) and analyzed monthly for plutonium.

The ambient air samplers are located at the following locations:

- Onsite - 25 air samplers are located on the RFP site.

- Perimeter - 14 air samplers are located at the perimeter of the RFP site at a distance of approximately 2 to 4 miles from the plant center. Figure AP.13-3 illustrates onsite and perimeter sampler locations. Table AP.13-1 describes these locations.

LUDLUM 12-1A DAILY PERFORMANCE TEST LOG

FIGURE AP.13-2

LUDLUM 12-1A DAILY PERFORMANCE TEST LOG

SERIAL #: __________ DATE DUE CALIB: __________ BUILDING: __________ SHIFT: ______

These forms will be used to record parameters noted during daily performance checks. If any instrument requires additional repair or service, return to E. T. Shop.

DATE/TIME	RPT NAME/#	SOURCE BOARD	SOURCE BOARD CPM				PROBE #	IN TOL.		FORMAN APPROVAL
			X1	X10	X100	X1K		YES	NO	

Source Board
Number __________
X1/CSL __________
X10/CSL __________
X100/CSL __________

Source Board
Number __________
X1/CSL __________
X10/CSL __________
X100/CSL __________

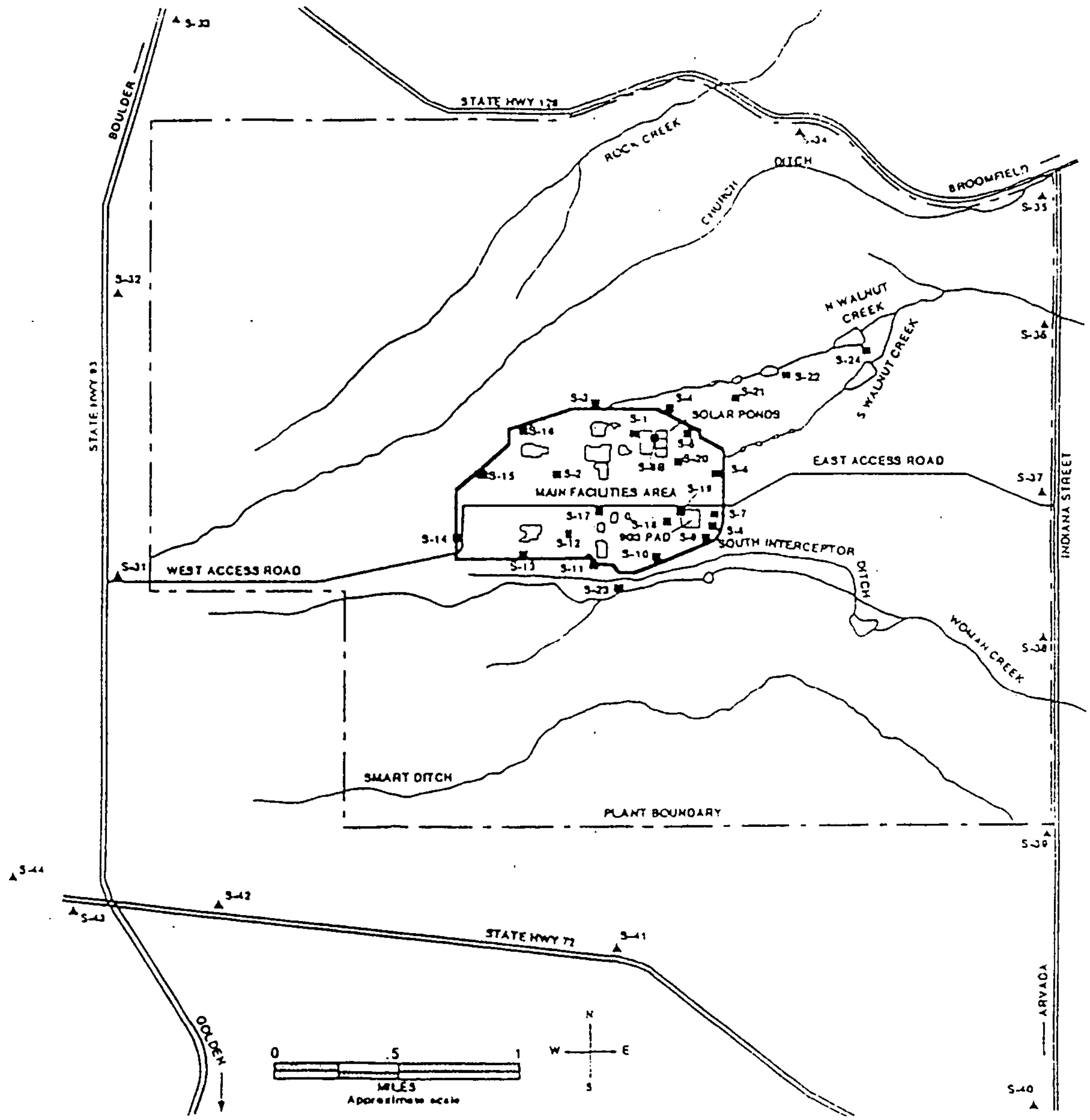
Source Board
Number __________
X1/CSL __________
X10/CSL __________
X100/CSL __________

THIS FORM WILL BE SUBMITTED TO OPERATIONAL HEALTH PHYSICS FOR PERMANENT RETENTION WHEN COMPLETE.

RF-47316

FIGURE AP.13-3

ONSITE AND PERIMETER SAMPLER LOCATIONS



LEGEND

Note: all samplers analyzed for Pu

■ Onsite Air Samplers

▲ Perimeter Air Samplers within 2 to 4 miles of RFP

TABLE AP.13-1. ONSITE AND PERIMETER SAMPLER LOCATION DESCRIPTIONS

ONSITE RAAMP SAMPLERS

SAMPLER NUMBER	25 LOCATIONS
S-01	East side of Building 788, between 788 and 207A Solar Pond.
S-02	East of Building 549, on power pole G-50.
S-03	On N.W. Perimeter Road, north of Building 371
S-04	On North Perimeter Road, next to plant fence, north of Solar Pond 207C, east of parking area 71.
S-05	Off Spruce Ave. in PA, directly east of Solar Pond 207B and scrap storage area.
S-06	East of Building 995 complex on the inside N.E. Perimeter Road, against plant chain link fence.
S-07	South of East Gate guard shack Building 900 inside the fence on the S.E. Perimeter Road.
S-08	South of East Gate guard shack Building 900 (0.1 miles) inside the fence on the S.E. Perimeter Road
S-09	Southwest of the East Gate guard shack Building 900 (0.2 miles) on S.E. Perimeter Road.
S-10	Ten (10) yards north of the inside S.E. Perimeter Road, half-way between the East Gate guard post Building 900 and Building 881.
S-11	South of Buildings 850 and 811, just off the inside S.E. Perimeter road (in corner of fence junction).
S-12	On N.E. corner of the intersection of Cedar Ave. and Seventh Street north of N.W. corner of parking area 81, Building 850.
S-13	Along the railroad tracks parallel to Cactus Ave., south of Building 440.
S-14	One Hundred (100) yards north of the West Gate guard shack, Building 100 along the chain link fence.
S-15	On the west side of the intersection of Safe Ave. and the inside N.S. Perimeter Road.

S-16	West of Building 371, outside the PA, at the eastern end of the inside N.W. Perimeter Road.
S-17	On the S.E. corner of the intersection of Central Ave. and Eighth Street.
S-18	East of Building 886 and West of the S.W. corner of the asphalt pad, on the gravel road to contractor storage area.
S-19	Immediately off Central Ave., west of the N.W. corner of the 903 asphalt pad area.
S-20	On the roof of Building 991, on the north side duct/filter plenum in the fenced 991 area of the Perimeter Security Zone (PA).
S-21	N.W. of the intersection of the outside N.E. Perimeter Road and the A-ponds access road.
S-22	S.W. corner of Pond A-1, north of the nitrate sump access road.
S-23	West of pond C-1 near Woman Creek, south of the outside S.E. Perimeter
S-24	East (outlet) of pond A-3, north of N. Walnut Creek, accessible by A-ponds access road.
S-8B	Near the northeast corner of pond 207-A

TABLE AP.13-1. ONSITE AND PERIMETER SAMPLER LOCATION DESCRIPTIONS

PERIMETER SAMPLER LOCATIONS

SAMPLER NUMBER	14 LOCATIONS
S-31	On east side of Highway 93, immediately north of west access road.
S-32	On east side of Highway 93, 1.3 miles north of west access road.
S-33	On east side of Highway 93, 2.8 miles north of west access road. 0.3 miles south of Highway 128.
S-34	On south side of Highway 128 near gate P.10 near Rock Creek, 2.8 miles east of Highway 93, 1.5 miles west of Indiana Street, N.E. corner or Buffer Zone.
S-35	On south side of Highway 128, 0.1 miles west of Indiana Street, N.E. corner or Buffer Zone.
S-36	East Buffer Zone, 0.2 miles west of Indiana Street, along gate P-15 access road adjacent to Walnut Creek. Gate P-15 is 0.7 miles north of east access road.
S-37	On Indiana Street at the east access road, in the raised asphalt median near plant sign.
S-38	On west side of Indiana Street (down embankment), 0.8 miles south of east access road.
S-39	On west side of Indiana Street, 1.8 miles south of east access road, 1.0 miles north of Highway 72.
S-40	At intersection of Indiana Street and Highway 72, in triangular median area.
S-41	On north side of Highway 72, 2.3 miles west of Indiana Street.
S-42	On north side of Highway 72, 0.5 miles west of Highway 93 towards Coal Creek Canyon.
S-43	On south side of Highway 72, 0.5 miles west of Highway 93 towards Coal Creek Canyon.
S-44	On north side of Highway 72, 2.1 miles west of Highway 93 near the mouth of Coal Creek Canyon.

- Community - 14 air samplers are located in the following communities and are described in Table AP.13-2:

  - Marshall
  - Jeffco Airport
  - Superior
  - Boulder
  - Lafayette
  - Broomfield
  - Walnut Creek
  - Wagner
  - Leyden
  - Westminster
  - Denver
  - Golden
  - Lakeview Pointe
  - Cotton Creek

Figure AP.13-4 illustrates community sampler locations. Air sampling routes are run weekly on the designated schedule of:

- Monday - onsite
- Tuesday - plant perimeter
- Wednesday - communities

Using the government vehicle provided, the sampling route will be according to Table AP.13-3, the table should be interpreted as beginning at top left corner and proceeding left to right and top to bottom.

TABLE AP.13-2 COMMUNITY SAMPLER LOCATION DESCRIPTIONS

SAMPLER NO.	14 LOCATIONS
S-51	Marshall: N.W. corner of Colorado Highway 170 and Cherryvale Road in Marshall. North of Colorado Highway 170, 3.3 miles west of McCaslin Blvd.
S-52	Jeffco Airport: 120th Ave. at Jefferson County Airport, west of Colorado Aerotech.
S-53	Superior: west side of McCaslin Blvd., 0.2 miles south of US 36, approximately 200 feet north of Coal Creek Road.
S-54	Boulder: east of Curie Cir. across from Building 25 in NBS complex, Broadway-Kentwood-Compton-Curie Cir.
S-55	Lafayette: north side of South Boulder Road, 0.2 miles east of South Public Road (Colo. 287) by the silo.
S-56	Broomfield: 8920 120th Ave. south side of 120th Ave. at Emerald Lane in Broomfield.
S-57	Walnut Creek Subdivision: 10800 N. Simms Street at 108th Ave. and Simms Street.
S-58	Wagner Station: 9430 Alkire Street on the east side, 0.3 miles south of 96th Ave. and Alkire.
S-59	Leyden: 16400 West 76th Dr., on N.W. corner of Quaker St. and W. 76th Dr.
S-60	Westminster: 3950 W. 72nd Ave., behind Westminster Parks and Recreation Division Storage Building. (Jerry Magnetti 429-1546 X470)
S-61	Denver: Roof of U.S. Customs House Bldg. at 20th and Stout in downtown Denver; above 5th floor by elevator shaft (Tony Valente of GSA, Bldg. Mgr. U.S. Custom House 844-4083).
S-62	Golden: S.E. corner of Highway 93 and Park Street on the north edge of Golden.
S-68	Lakeview Pointe, 1000 Simms St. at S.W. corner of 100th Ave. and Simms St. S.W. from Lakeview Pointe subdivision.
S-73	Cotton Creek: 4580 S. 112th Ave. in Westminster, on N.E. side of Westminster Fire Station No. 4.

FIGURE AP.13-4
COMMUNITY SAMPLER LOCATIONS

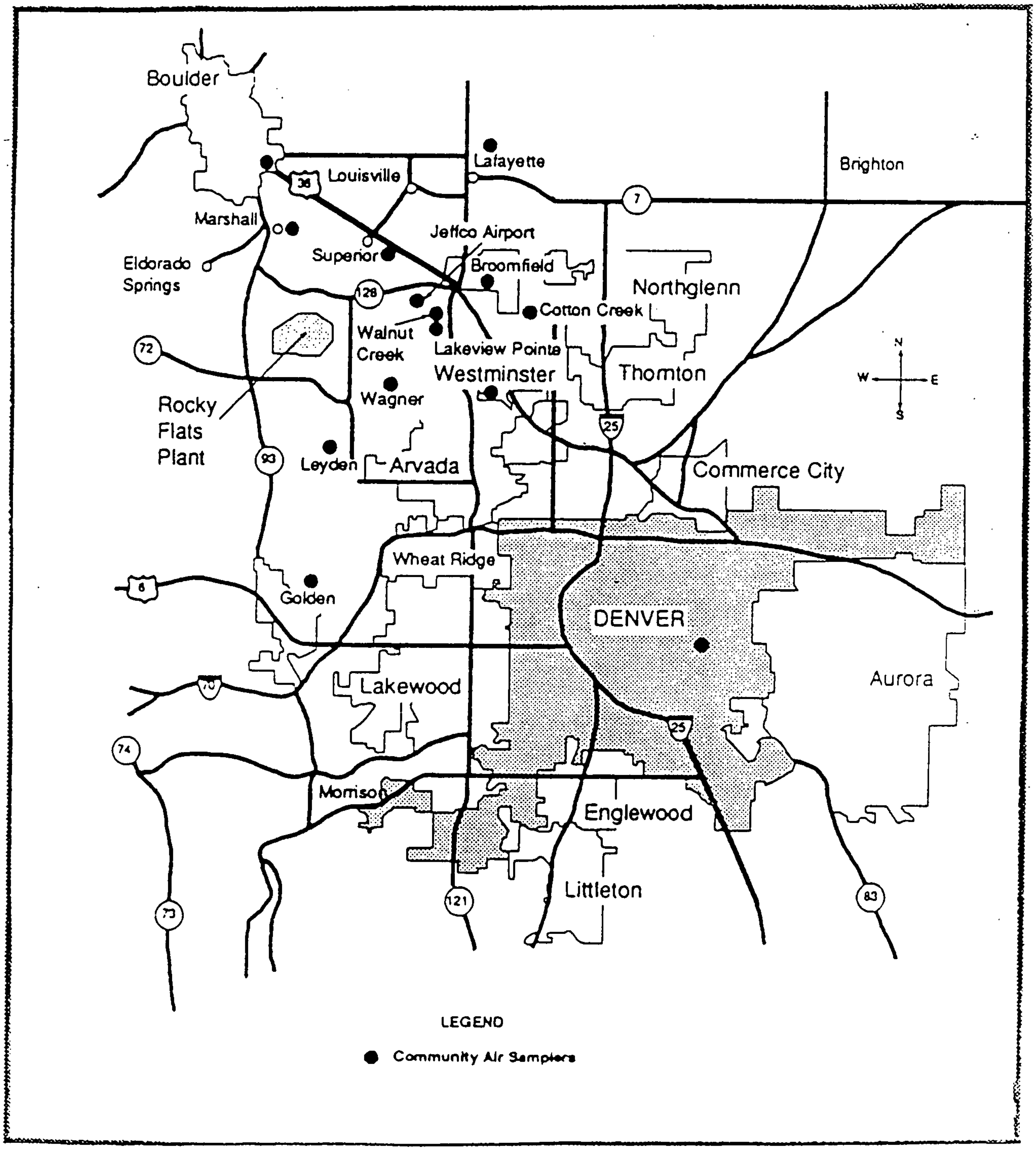


TABLE AP.13-3 SAMPLING ROUTE

Monday:	18	10	11	12	2	17	19
	7	8	9	4	21	22	24
	6	13	23	14	15	16	3
	1	8B	5	20			
Tuesday:	36	37	38	39	40	41	42
	43	44	31	32	33	34	35
	53	51	54				
Wednesday:	52	57	68	58	59	62	61
	60	73	56	55			

Note: The EMAT is required to park the government vehicle off the road in a safe area.
Warning: In remote areas, beware of rodents, reptiles and wild animals.
Warning: Be alert for bees, hornets, and other stinging insects before lifting sample cover.
Note: The sampler covers may be very hot or cold to the touch, depending on weather conditions.

The following are the supplies required to service each sampler on the weekly inspection and biweekly filter change:

- Ludlum 12-1A instrument
- RAAMP field log
- Protective identification envelopes
- Air filters
- Marking pens
- Thermometer

5.2.2 Filter Change

The EMAT will be issued a key to unlock the cover of each sampling unit (see Figure AP.13-5). Unlock the cover and slowly open the cover. Be alert for potential hazards such as bees, etc.

Secure open cover by latching hook to the electrical pole attachment (see Figure AP.13-6). Failure to secure latching hook may result in serious injury and damage to filter.

Record the following data on the Ambient Air Monitoring Log sheet (see Figure AP.13-7):

- Employee/job title
- Calibration instrumentation due date
- Physical condition of sampler
- Work activities being monitored
- Ambient air sampler calibration date
- Sampling interval
- Date/time
- Flow meter reading
- Hour meter reading
- Temperature at sampler
- Comments (such as weather conditions)

At the discretion of the RAAMP Manager, take an alpha particle reading with a Ludlum 12 1A. Record this reading on a RAAMP Alpha Background Survey log sheet.

Record the sampler flowmeter data by logging the data on pre-labeled envelope (See Figure AP.13-8) and logging the data in the RAAMP field log book.

FIGURE AP.13-5

UNLOCKING SAMPLER UNIT

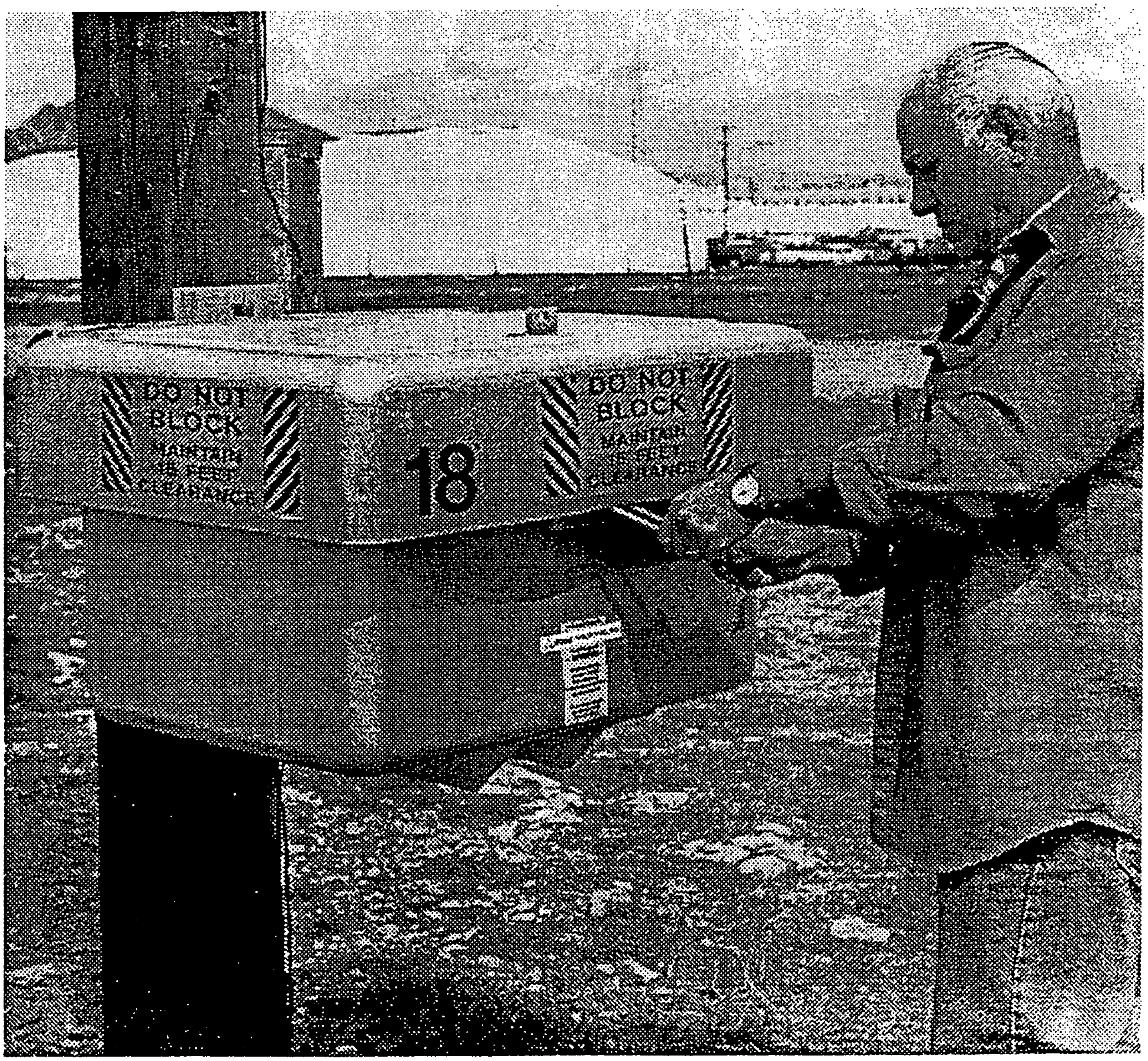


FIGURE AP.13-6

LATCHING HOOK TO ELECTIVE POLE ATTACHMENT

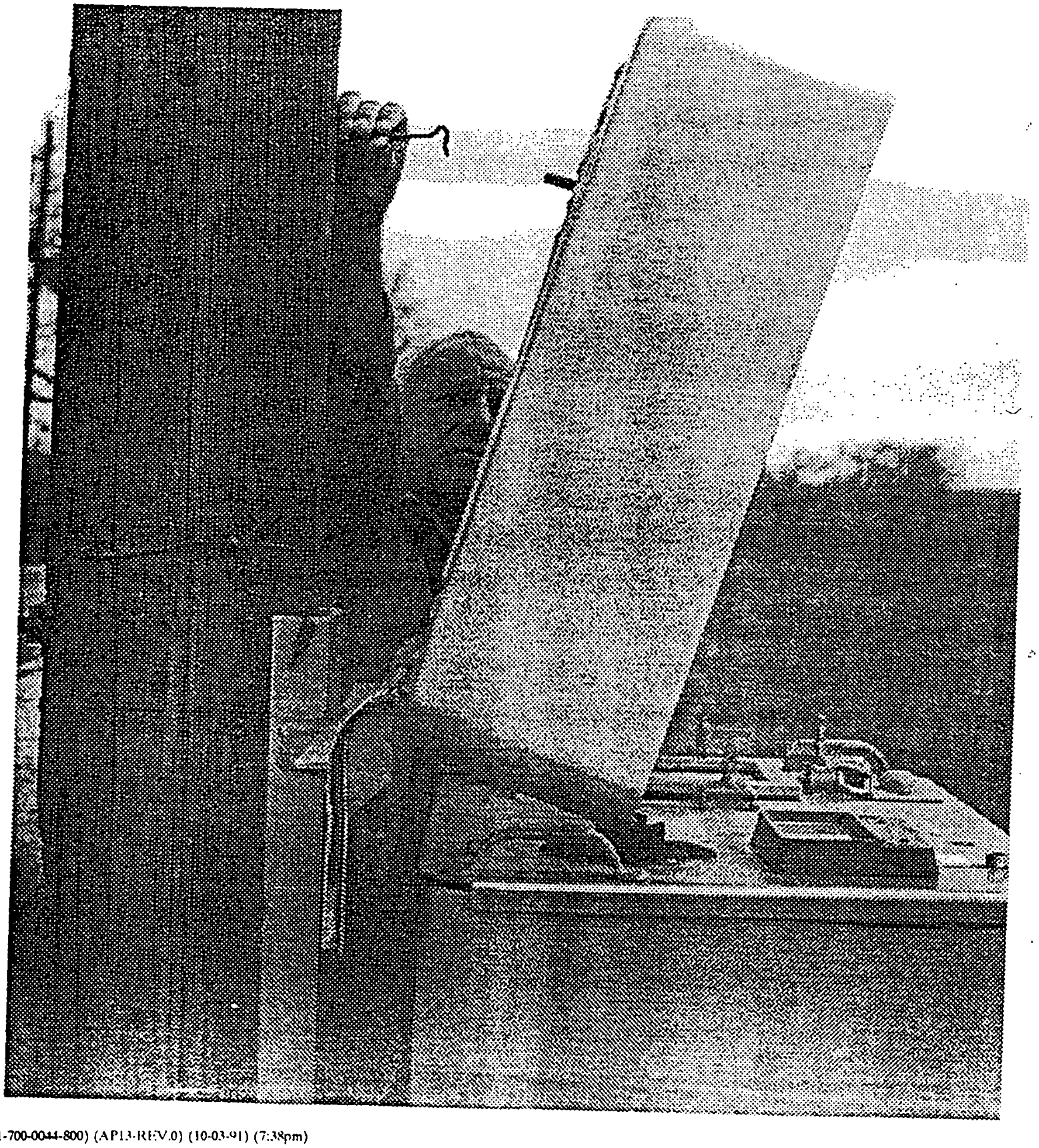


FIGURE AP.13-7

RECORDING DATA ON AMBIENT AIR MONITORING LOG SHEET

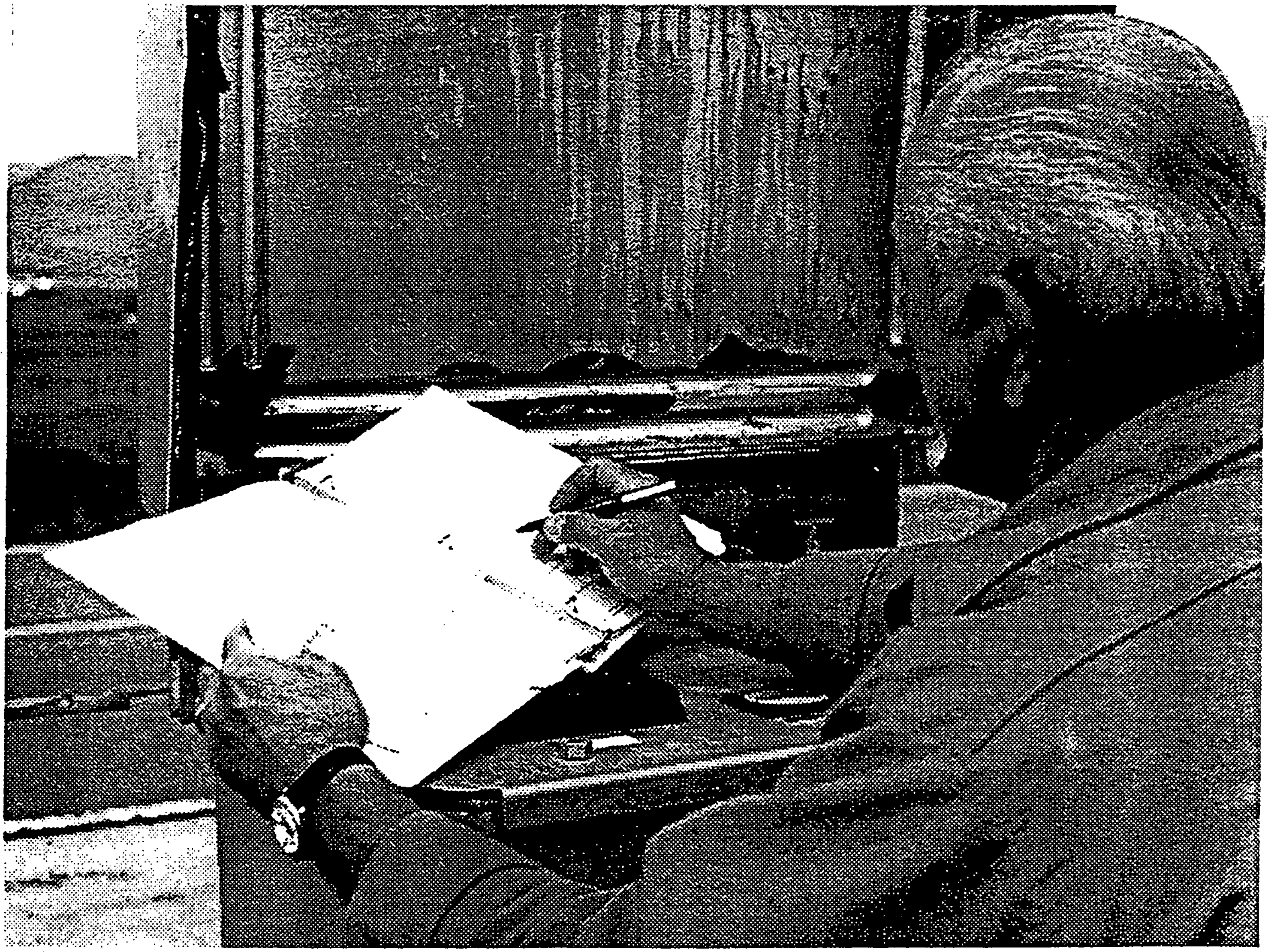


FIGURE AP.13-8

RAAMP ENVELOPE LABELS

RAAMP Filter

Onsite Sampler: S- Sampler Number for example: 01

Date On: M/D/Y Timer On: Hour Meter Reading

Flow On: Flow Meter Reading Ex: .92 m^3/min

One Week Check Date: M/D/Y

No Filter Change

Once Week Flow: .73 Time: 3247.4

Date Off: M/D/Y Timer Off: 3593.0

Flow Off: .91 m^3/min

Elapsed Run Time: Date off time - Date on time / Example: 3593.0 - 3259.7 = 333.3 Hours

RAAMP Filter

Perimeter Sampler: S- ______

Date On: ______ Timer On: ______

Flow On: ______ m^3/min

One Week Check Date: ______

No Filter Change

Once Week Flow: ______ Time: ______

Date Off: ______ Timer Off: ______

Flow Off: ______ m^3/min

Elapsed Run Time: ______ Hours

RAAMP Filter

Community Sampler: S- ______

Date On: ______ Timer On: ______

Flow On: ______ m^3/min

One Week Check Date: ______

No Filter Change

Once Week Flow: ______ Time: ______

Date Off: ______ Timer Off: ______

Flow Off: ______ m^3/min

Elapsed Run Time: ______ Hours

Record the elapsed time from the hour meter. Log the data on pre-labeled envelope and log data in the RAAMP field log book.

To complete the filter change, follow the steps below:

- Open all clamps that hold down metal frame by lifting each one upwards (see Figure AP.13-9).

- Remove the metal frame and rubber seal and place to the side. Use care not to contaminate air filter surface area with particulates from other sources, i.e., metal faceplate of sampler. Remove filter paper from fine mesh support screen (see Figure AP.13-10).

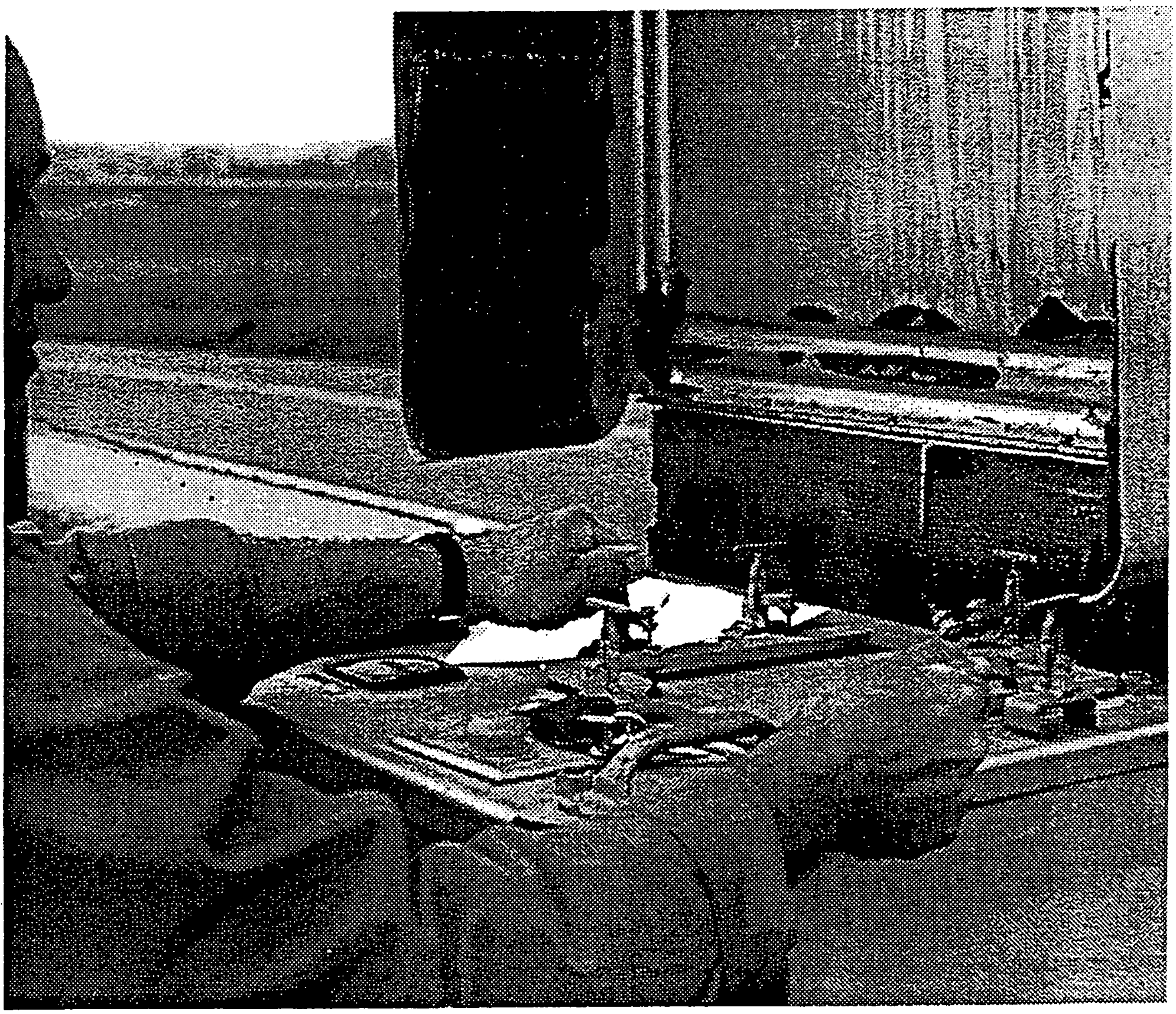
- Fold the filter paper with the exposed side inward.

- Place the folded filter into the pre-labeled envelope (see Figure AP.13-11).

- Be sure the envelope is marked with the sampler identification number, the initial airflow rate for the newly installed filter, final airflow rate for the old filter, date, and elapsed time readings.

- Place envelope (with filter) on the clip attached to the sampler.

FIGURE AP.13-9
OPENING CLAMPS FOR METAL FRAMES



EG&G ROCKY FLATS PLANT	Manual:	5-21000-OPS
EMD MANUAL OPERATION SOP	Procedure No.:	AP.13, Rev. 0
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	Effective Date:	October 1, 1991
Category 2	Organization:	Environmental Management

FIGURE AP.13-10
REMOVAL OF METAL FRAME, RUBBER SEAL AND FILTER PAPER

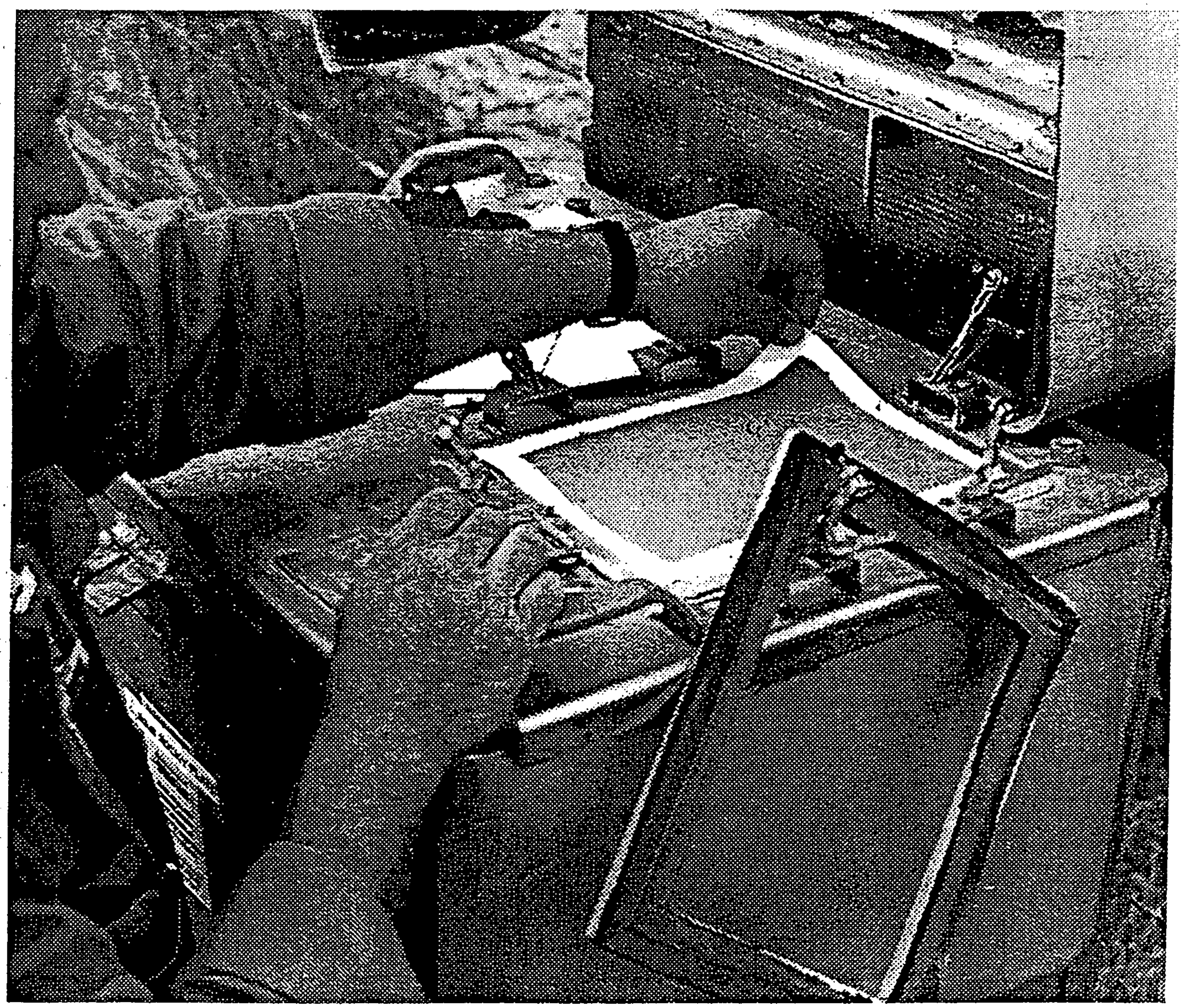
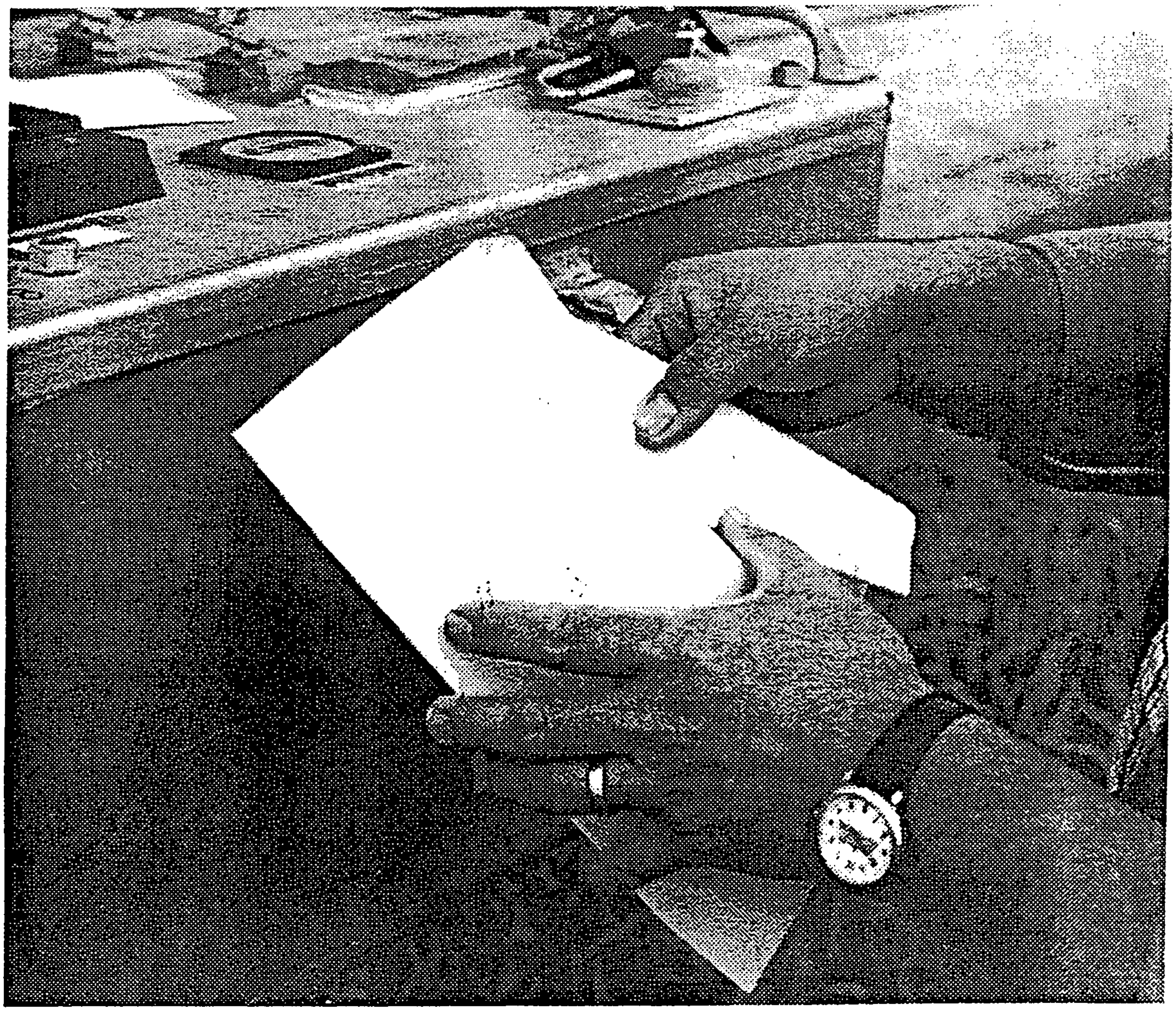


FIGURE AP.13-11
INSERTION OF FOLDED FILTER INTO PRE-LABELED ENVELOPE



5.2.3 **New Filter Installation**

To install the new filter, follow the steps below:

- Carefully remove a new filter from its box. (If the wind is blowing, it may be necessary to loosely roll the filter to protect it.)
- Place the filter on the fine mesh support screen, covering the screen completely.
- Replace the rubber seal by fitting it over the position-locating pin.
- Replace the metal frame by fitting it over the position-locking pins.
- Close all retaining clamps.
- Read and record the initial flowmeter reading for the beginning of the filter cycle (log data on the pre-labeled envelope; log data in the RAAMP field log book).
- Read and record the elapsed time (hour meter) (log data on the pre-labeled envelope; log data in the RAAMP field log book).
- Record the date (log data on the pre-labeled envelope; log data in the RAAMP field log book).
- Record the sampler identification number (log data on the pre-labeled envelope).
- Remove filter and envelope from sampler clip, store in designated box in government vehicle.

- Unlatch the cover from electrical pole.
- Close cover.
- Secure lock on air sampler.
- Proceed to the next sampler on the route. Repeat this process until route is completed.

5.2.4 Weekly Equipment Inspection

All samplers will have a weekly inspection halfway through the 2-week sampling period. EMATs will check the air sampler for proper operation and record airflow data. No filter exchange will take place during this interim inspection. Open and close the sampler cover with the same procedure described in 6.2.3 New Filter Installation. Take the following steps:.

- Read and record flow rate on pre-labeled envelope.
- Read and record flow rate in the RAAMP field log book.
- Read and record elapsed time on pre-labeled envelope.
- Read and record elapsed time in the RAAMP field log book.
- Record date on pre-labeled envelope.
- Record date in the RAAMP field log book.
- Proceed to next sampler and repeat procedure until route is finished.

5.2.5 Filter Analysis

The biweekly collection of onsite, perimeter, and community filter samplers is taken to the RH laboratories in the protective identification envelopes. A chain of custody form is then completed by the EMAT. This form documents the exchange of air samples between the RAAMP EMAT and RH Labs.

The RH Laboratories Central Receiving Area assumes custody of the RAAMP filters from the EMATs. The Central Receiving Area also coordinates the analysis of the filters as described by the Environmental Management "Catalog of Monitoring Activities."

5.2.6 Unusual Observations

Any activity that could affect the sampling or results of a RAAMP air sampler must be recorded in the RAAMP field log book. The EMAT will immediately relay this information to the RAAMP Manager. Examples of unusual observations are odors, noise, construction, or earth-moving activities, or unusual filter characteristics.

5.3 EQUIPMENT DESCRIPTION

5.3.1 Sampler Operation

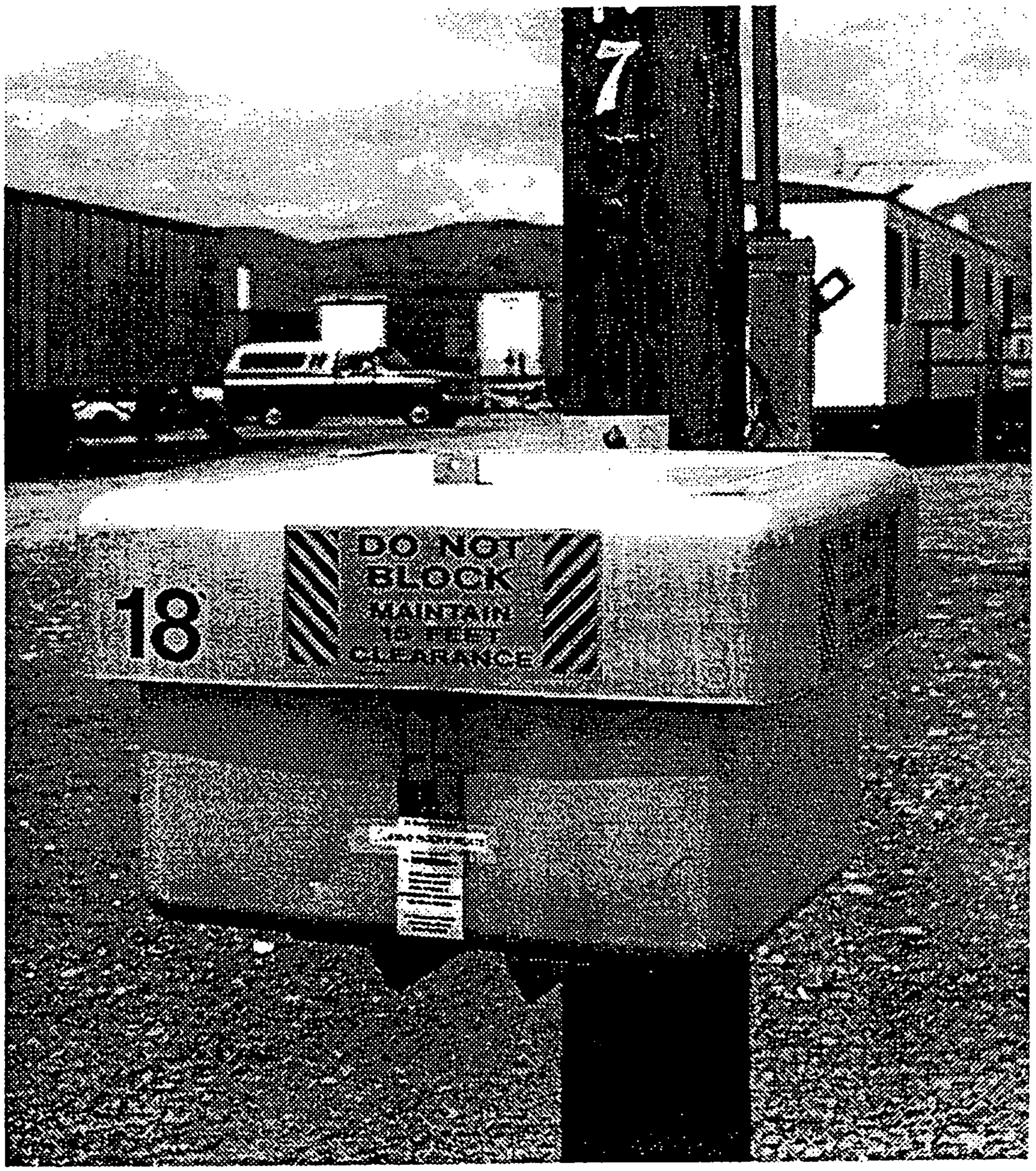
The ambient air samplers of the RAAMP network are currently an RFP design unique to the plant site. The ambient air samplers incorporate a commercially available Rotron blower. This blower is mounted in a Zero Manufacturing Company aluminum box in such a manner that the blower exhaust air will cool the motor bearings, thus extending their life. The blower is equipped with inlet and exhaust mufflers for noise control. Also included is a Dieterich Standard Corporation Eagle Eye flowmeter operated by an annular differential pressure sensor (used as a flow measuring probe) and a continuous, non-resettable elapsed time indicator.

The ambient air sampler operates continuously, producing a constant volume of air (approximately 20-35 cubic feet per minute [cfm]) through a Schleicher & Schuell No. 29 filter. The operating noise level is approximately 45 decibels absolute (dBa) at a distance of 10 feet which is lower than the ambient noise level at most sampler locations. This allows RAAMP samplers to be placed in residential and community areas. The continuous or non-resettable elapsed time indicator (noted as an hour meter) keeps very accurate time (to better than ±0.1%) during operation. Because of equipment failure, downtime may range from minutes to several hours. Each sampler requires a 115 volt, 60 cycle single-phase electrical service which is controlled by a boot-covered On/Off switch. Figure AP.13-12 shows an ambient air sampler mounted on an electrical pole. Figures AP.13-13 and AP.13-14 show the equipment configuration of a RAAMP air sampler.

Airflow entering the sampler follows a direct route through the sampler. Air is introduced through the 1.5 inch overlap between the lid and body of the sampler. Air is forced through the filter mounted on the intake opening by suction of the blower motor and then exits the unit. The Annular D.P. Sensor is located in the exhaust tube and contains two flow nozzles which produce a differential pressure signal that triggers the flow indicator. Time of this operation is monitored by the General Electric elapsed time meter and indicated in hours.

The ability of the filter to efficiently capture particles in the required size range is a critical performance aspect of the ambient particulate monitoring network. The filter media used by the RFP samplers is an 8 by 10 inch S&S No. 29 glass filter manufactured by Schleicher & Schuell. The S&S No. 29 glass filters are manufactured from synthetic fibers which dissolve readily in the laboratory and do not interfere with ion exchange analysis. The effectiveness of the RFP-designed high volume air sampler employed in routine ambient air monitoring has been evaluated by a consultant, Dr. James B. Wedding, of FAME Associates, Inc. On the basis of this specific filter media, the design has been shown to be 99.9 percent efficient for particle sizes of 0.3 micron and air pressure drops typical of ambient air sampling. In turn, the analysis of the ambient air filters were a vital consideration when selecting filter paper. The analyses require complete dissolution of the filter media and chemical separation by ion exchange techniques. The efficiency of collection

FIGURE AP.13-12
AMBIENT AIR SAMPLE MOUNTED ON ELECTRIC POLE



and low background ensures accuracy in chemical analysis. Reference to this is in the RFP Environmental Impact Statement (1980).

5.4 SAFETY PRECAUTIONS

5.4.1 Safety Precautions for the RAAMP EMAT

EMATs who are assigned the air sampling route must be aware of any potential safety hazards associated with operating air samplers or auxiliary equipment. The following items are precautions the EMAT should follow when out and about on the air sampler route:

- Fully understand the air sampler operation and its controls.

- Visually check each air sampler unit during the weekly and biweekly inspection for any internal or external physical damage or evidence of electrical malfunction. Report any damage or problems to the RAAMP Manager.

- Understand the responsibility required for operating a government vehicle. EMATs must have a valid Colorado driver's license, a safe driving record, and are required to operate the vehicle in a courteous manner at all times. In addition, the sampling vehicle will carry an emergency kit which includes: a two-way radio, first aid and snake bite kits, flashlight, flares, jumper cables, tools, jack and spare tire.

- EMATs must understand regulations of vehicle entry into the Protected Area (PA), and restricted areas. Entrance into the PA requires a vehicle pass that is issued by the RFP Security Safeguards Department. Access to restricted areas will be addressed by the RAAMP Manager.

FIGURE AP.13-13

EQUIPMENT CONFIGURATION OF THE TOP OF A RAAMP AIR SAMPLER

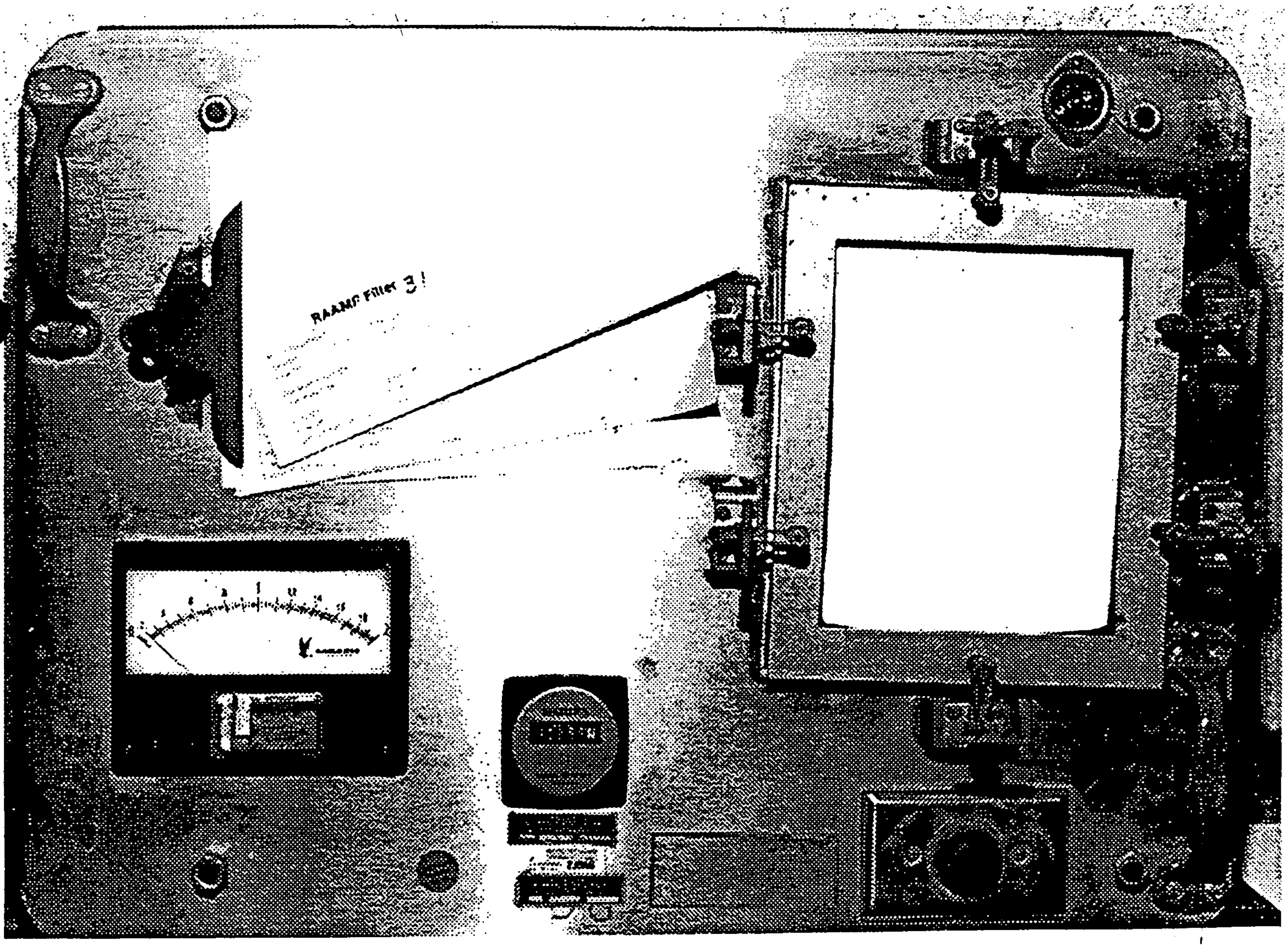
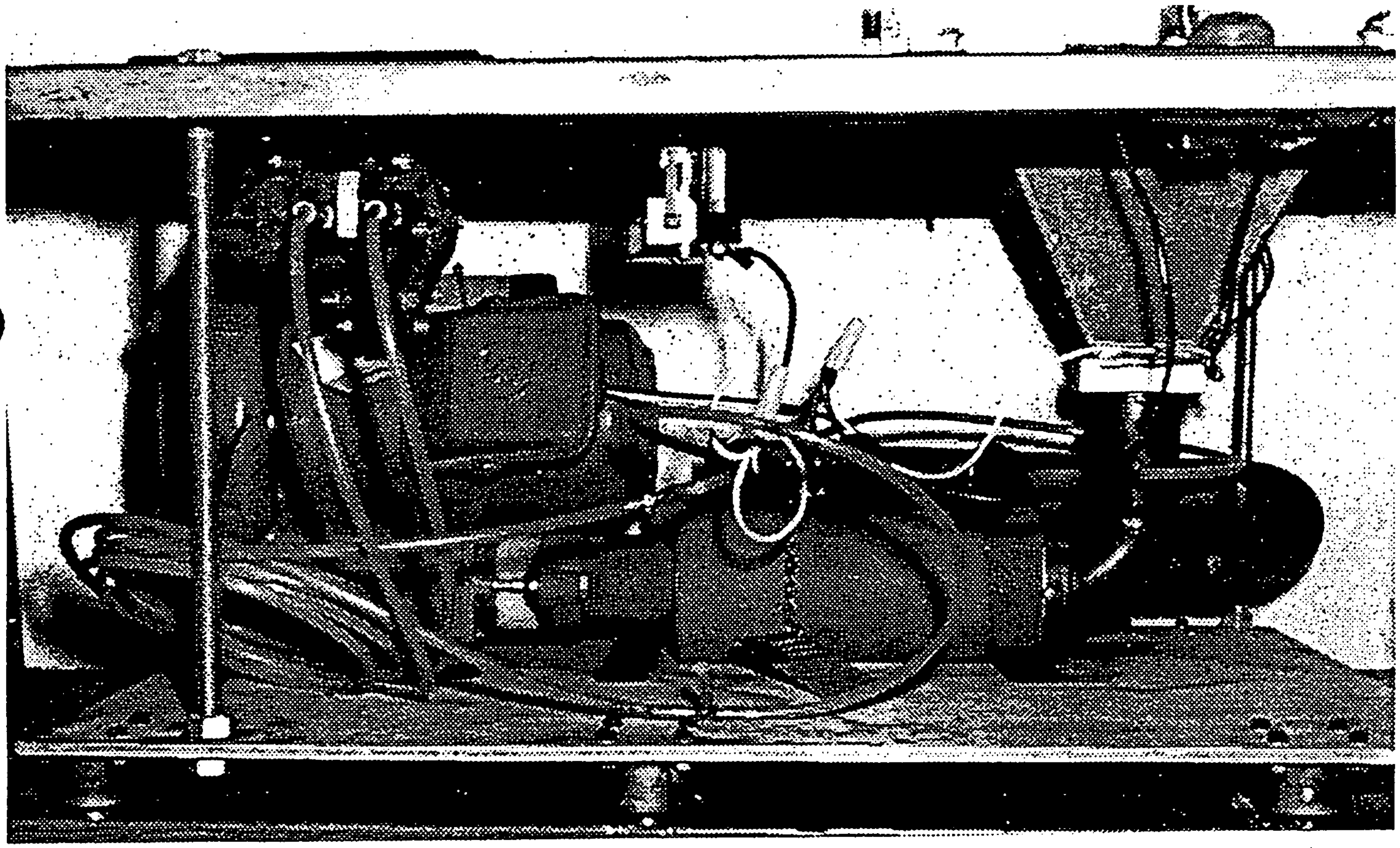


FIGURE AP.13-14

EQUIPMENT CONFIGURATION INSIDE A RAAMP AIR SAMPLER



5.4.2 Recommended Apparel

Approximately 80 percent of the ambient air sampler route is located out of doors. The EMAT will encounter all types of weather. Proper clothing will vary depending on the weather. Clothing considerations should conform to Table AP.13-4:

TABLE AP.13-4
CLOTHING CONSIDERATIONS

Spring -	light jacket/hood rough terrain pants windbreaker/raincoat high top leather boots sunglasses
Summer -	light long sleeve shirt rough terrain pants high top leather boots snake chaps sunglasses
Autumn -	light jacket/hood rough terrain pants windbreaker/raincoat high top leather boots sunglasses
Winter -	heavy coat/hood rough terrain pants insulated coveralls thermal gloves high top leather boots sunglasses

5.4.3 Field Precautions

The EMAT must be careful when touching sampler covers that have been exposed to direct sunlight or have been exposed to cold for an extended time.

In addition, the EMATs should be wary of bees, hornets, etc., when opening sampler covers. Also be aware of rodents, wild dogs, skunks, and rattlesnakes in remote locations. Use caution in highly weeded areas, and make noise to scare away rodents and reptiles. Make certain a first aid kit is in the government vehicle at all times. Inspect this kit occasionally for outdated or missing supplies. Report any animal attack, insect sting, or other injury to the closest medical center immediately. Then notify the RAAMP Manager.

The following areas on the air sampler route may become potential hazards, depending on the season and weather conditions:

- Steep culverts
- Deep muddy ruts
- Barbed wire fences
- Gates
- Heavy vehicle traffic
- Fugitive dust

Fugitive dust often creates an eye irritation, especially in summer. Carry safety goggles and appropriate footwear - a high top leather boot with adequate hiking terrain soles.

5.5 INSTRUMENT STANDARDIZATION AND CALIBRATION

Air samplers of the RAAMP network are calibrated biannually by the Physical Metrology Laboratory (PML). Calibration data is supplied by the PML to the RAAMP Manager. Calibration is done by comparing the flow indicator readings on the air sampler meter with the standard flow tube metering under full scale flow and minimum flow conditions. Several intermediate flow levels are also checked through the entire flow range of the sampler indicator. The air sampler flow has zero dampening and span adjustment screws located on the meter face. Personnel calibrating air samples will compare standard reference volumetric flow rates and the average observed flow rates registered by the air sampler flowmeter. Both the referenced rates and the observed rates are reported to Environmental Managements RAAMP Manager. The calibrations are used to make certain the air sampler volumes reflect the actual air sampling rate (see Figure AP.13-15). Additional information concerning equipment setup and operation can be found in the RFP procedure "High Volume Air Sampler Calibration."

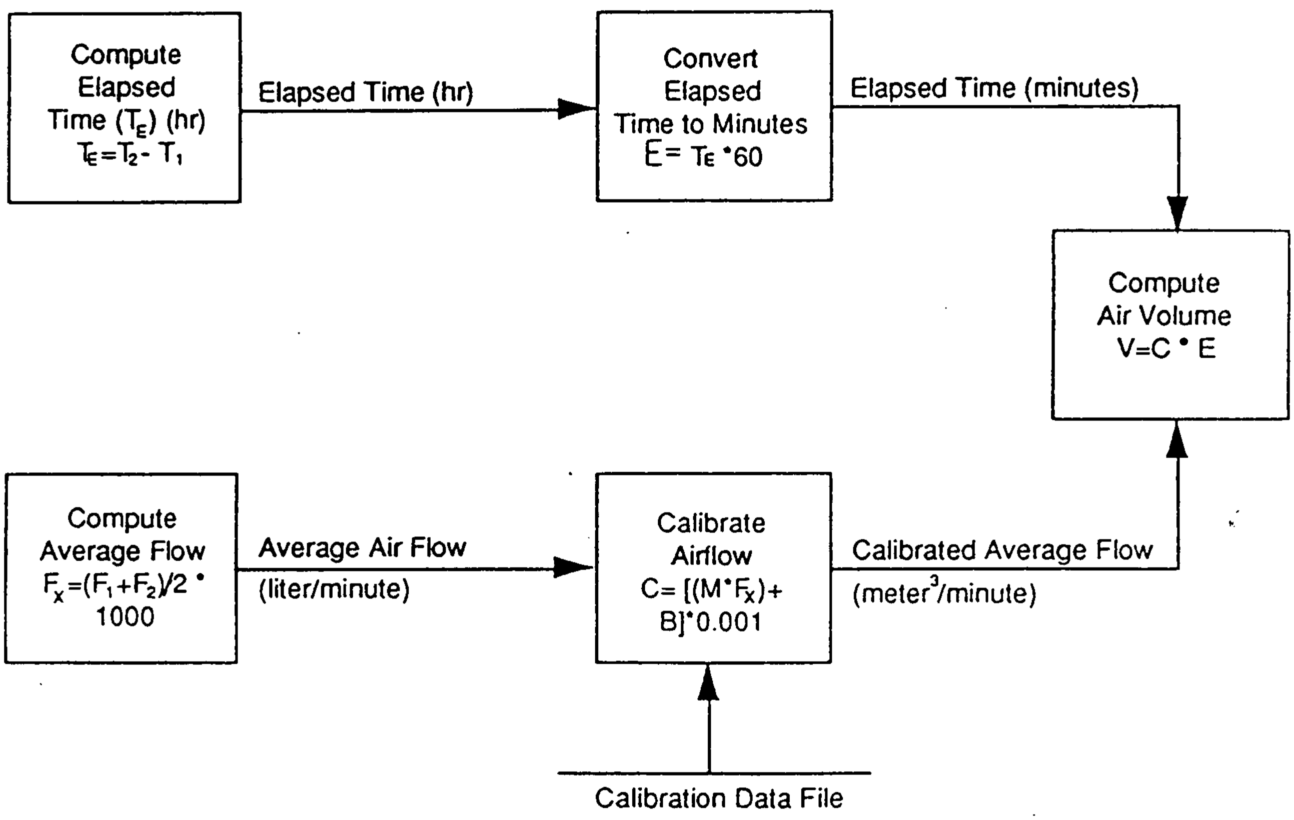
5.6 CALCULATIONS AND RECORDS SPECIFICATIONS

The RAAMP Manager is responsible for monthly air data calculations and preparation of a monthly ambient air report for inclusion in the RFP Monthly Environmental Monitoring Report. The following information is a guideline for preparation of this report.

5.6.1 Air Flow

Air flow readings are recorded in the RAAMP field log by the EMAT conducting the air route and copies given to the RAAMP Manager. Each sheet reports the date, elapsed time (hours), and flow rate for the individual air samplers at three times designated as initial, inspection and final readings. Data are reported from up to fifty-three air samplers, although a reduced number may occur through unplanned anomalies.

FIGURE AP.13-15
WEEKLY AIR VOLUME CALCULATION



NOTE: Calibration data is given in liters/minute whereas air flow is given in meter^3/minute. Consequently, air flow values are multiplied by 1000 then applied to the linear calibration equation (y=mx+b, where x is the uncalibrated air flow) and then multiplied by 0.001 to reduce values back to meter^3/minute.

Processing: Volumes of airflow are calculated weekly and then totaled for the interval specified for the RFP monthly report. Calculations for the weekly volumes are as follows:

$$E=(T2-T1) * 60$$
$$C=[((F2 + F1)/2) * 1000 * M) + B)] * .001$$
$$V=E * C$$

Where:

T1 = Start of the sampler interval (hours)

T2 = End of the sample interval (hours)

F1 = Flow rate at T1 (cubic meters per minute)

F2 = Flow rate at T2 (cubic meters per minute)

M = Slope of the linear calibration equation (Y = MX + B)

B = Dependent variable intercept of the linear calibration equation (Y = MX + B)

E = Elapsed time (minutes)

C = Calibrated airflow (meter cubed/minute)

V = Volume of air (meters cubed)

5.6.2 Plutonium Concentrations

Plutonium samples are composited monthly and comprise 2 or 3 filters from each sampler.

Results of laboratory analysis on air filters are reported monthly from the Radiological Health Laboratory as output from the Flow II Gemini system. Interval, plutonium concentration (dpm), and an error factor are given for each air sampler. Multiple intervals per air sampler may be reported depending on the schedule for compositing samples. Corrections to the plutonium values, accounting for the blank sample analysis, are electronically transferred to the Environmental Management office.

Plutonium Concentration: Disintegrations per minute for composite samples are converted to picocuries (pCi) by dividing by 2.22. This value is divided by total air volume for the sample period to determine plutonium concentration. Error factors are calculated in the same manner. The formula for monthly plutonium concentration is as follows:

Total pCi	= dpm/2.22
Total Air Volume	= total air volume
Total pCi/meter	= total pCi / total air volume

Where: dpm = disintegrations per minute(sum of dpms from all sample intervals within the reporting period)

An annual mean concentration is calculated for perimeter and community samplers. This value is determined by summing the eleven previous month's concentrations plus the current month and dividing by twelve.

5.6.3 Calibration Reports

Air samplers are calibrated biannually to account for individual deviations in measurement accuracy. Calibrated values are reported by the PML to the RAAMP Manager in terms of a linear adjustment to observed values. Calibration report values are used in calculations of airflow.

5.6.4 Output

Plutonium concentrations are reported for onsite, perimeter, and community samplers. The grouping of air samplers in each category is as follows:

- On site - S-01 through S-24 and S-8B

- Perimeter - S-31 through S-44
- Community - S-51 through S-62, 68 and 73

Each table provides the identification of the sampler, number of samples, air volume, plutonium concentration and error factor.

Plutonium concentrations are also reported in the numbered bar graphs for perimeter and community samplers. Each numbered bar graph displays concentrations for each sampler adjacent to the annual mean concentration for that location.

5.7 SHUTDOWN

RAAMP air samplers will not be turned off without prior approval of the Environmental Management RAAMP Manager. Air samplers will only be shutdown for approved requests or required maintenance or to prevent equipment damage from occurring by allowing the sampler to continue operating when in need of repair.

6.0 DOCUMENTATION

6.1 PROTECTIVE ENVELOPES

Envelopes used to package exposed air filters are 5 x 11.5 inches. They prevent cross-contamination of filters. Each envelope has its own 3 x 5 inch RAAMP identification label, used to record the following information for each sampler:

- Location of sampler and identification number of sampler. The RAAMP sticker is classified according to the onsite, perimeter, or community location of the individual sampler.

- For the initial filter installation, record the following data:

  - Date on: mo/day/year
  - Timer on: reading when changing filter
  - Airflow on: direct from flowmeter (read in m^3/min)

- For the weekly sampler inspection, record the following data:

  - Date: mo/day/year
  - Airflow: direct from flowmeter (read in m^3/min)

- For the biweekly filter change, record the following data:

  - Date off: mo/day/year
  - Timer off: reading when changing filter
  - Flow off: direct from flowmeter
  - Elapsed run time: total biweekly hours of air sampler operation

6.2 AMBIENT AIR MONITORING FIELD LOG

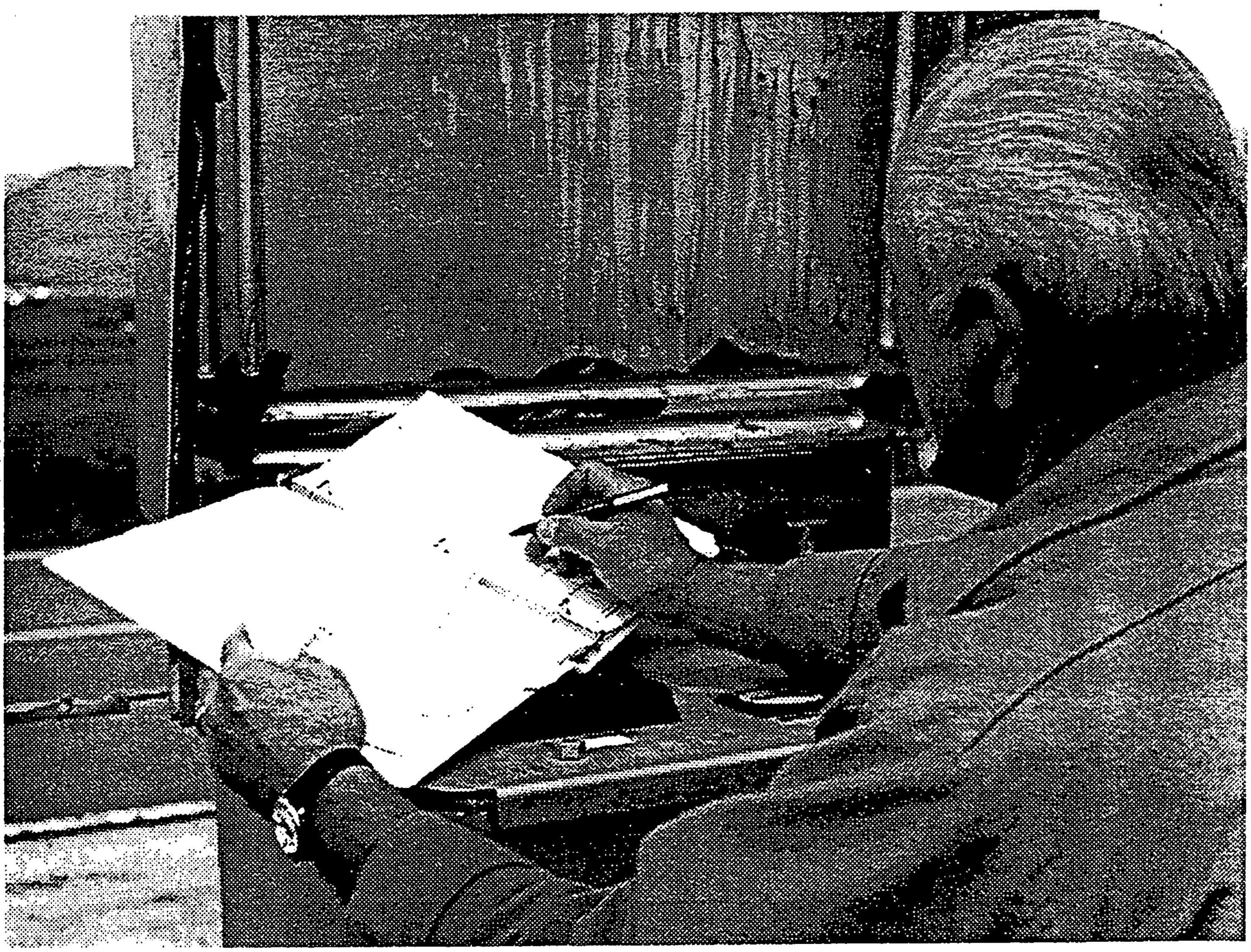
The ambient air monitoring field log is used to document historical data for each sampler on the air monitoring network. The data is logged into this document on a weekly basis. Information includes the following:

- Physical condition of sampler
- Work activity being monitored
- Ambient air sampler calibration date
- Sample filter No.

- Ambient air sampler lab
- Date/time
- Flow meter reading
- Hour meter reading
- Air temperature at sampler
- Weather conditions
- Equipment failure
- Maintenance performed

Additionally, unusual circumstances in the area or with the actual sampler must be noted (see Figure AP.13-16).

FIGURE AP.13-16
DOCUMENTING WITHIN THE AMBIENT AIR MONITORING FIELD LOG



U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM FO.14II

HEALTH/ENVIRONMENT LABORATORY
ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY RECORD (AIR SAMPLES)

Project Description (No.)

Project Responsibility

Sampler(s): (Signature)

Sample Type	Customer Identification	H/E Lab Number (By CRL)	Comp.	GRAB	Time (Mill.)	Date	Sample Location	Dis. Spl. Volume (ml)	Aligust Volume/Run No.			Plutonium (PHA)	Americium (PHA)	Uranium (PHA)	Uranium-Phosphorim	Tritium				Remarks

Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (signature)

Custody Record Page ______ of ______ Pages | Sample Batch No. ______ | Reagent Nos. ______

RF-47151 (4/87)

FORM AP.13A

LUDLUM 12-1A DAILY PERFORMANCE TEST LOG

SERIAL #: ______________ DATE DUE CALIB: ______________ BUILDING: ______________ SHIFT: ________

These forms will be used to record parameters noted during daily performance checks. If any instrument requires additional repair or service, return to E. T. Shop.

DATE/TIME	RPT NAME/#	SOURCE BOARD	SOURCE BOARD CPM				PROBE #	IN TOL.		FORMAN APPROVAL
			X1	X10	X100	X1K		YES	NO	

Source Board
Number ______________
X1/CSL ______________
X10/CSL ______________
X100/CSL ______________

Source Board
Number ______________
X1/CSL ______________
X10/CSL ______________
X100/CSL ______________

Source Board
Number ______________
X1/CSL ______________
X10/CSL ______________
X100/CSL ______________

THIS FORM WILL BE SUBMITTED TO OPERATIONAL HEALTH PHYSICS FOR PERMANENT RETENTION WHEN COMPLETE.

RF-47316

RESTORATION PROJECTS DATA REDUCTION FOR RADIOACTIVE AMBIENT AIR MONITORING

EG&G ROCKY FLATS PLANT	**Manual:**	**5-21000-OPS**
EMD MANUAL OPERATION SOP	**Procedure No.:**	**AP.15, Rev. 0**
	Page:	**1 of 7**
	Effective Date:	**October 1, 1991**
Category 2	**Organization:**	**Environmental Management**

TITLE:
RESTORATION PROJECTS DATA REDUCTION FOR RADIOACTIVE AMBIENT AIR MONITORING

Approved By: Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

The purpose of this procedure is to establish and document the process to reduce radioactive ambient air particulate data from the remediation projects or Operable Units (OU). These data are included in the Monthly Environmental Monitoring Report.

The purpose of the monitoring program is to quantify the concentrations and species of radioactive ambient particulates present during characterization and restoration activities at the investigation sites. Data is used to address baseline risk assessment and environmental concerns. It is imperative that data be of high quality and totally defensible through proper record keeping and adherence to accepted methodologies, regulations, and guidelines.

3.0 RESPONSIBILITIES

3.1 PROGRAM MANAGER RESPONSIBILITIES

It is the responsibility of the Air Program manager to insure that all radioactive particulate air sampling and data reduction is performed in compliance with approved methods and specific OU work plans. The program manager is also responsible for completion and coordination of the following items:

1) Establishment of All Database Requirements,
2) Data Assessment and Report Preparation,
3) System Audits,
4) Quality Assurance (QA) Oversight and Records Maintenance.

3.2 FIELD PERSONNEL

The Environmental Management Department (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform the field sampling. The EMATs principal responsibilities are to record field data on log sheets and change filters in the air monitoring samplers. This is a two-step procedure and is completed on a weekly basis. Initially, a filter is installed and the necessary data is recorded on log sheets for all samplers. A week after the filter is installed, the data is recorded again. The filter is then removed and submitted to the Radiological Health Laboratory for analysis. A new filter is installed to replace the filter that is removed and the necessary data is recorded again.

The data collected from the samplers is copied from the log sheets to a portable computer program. This information is then duplicated on a floppy disk and loaded onto a main frame computer program (i.e. Oracle or SAS). These programs calculate the final reportable data as well as store the calculated and raw data.

4.0 REFERENCES

4.1 SOURCE REFERENCES

U.S. Environmental Protection Agency, 1976. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II Ambient Air Specific Methods. EPA-600/4-77-027a.

Wedding and Associates, Inc., Operating Manual, The Wedding and Associates TSP Critical Flow High Volume Sampler.

4.2 INTERNAL REFERENCES

- SOP AP.12, Radioactive Ambient Air Monitoring Program

5.0 CALCULATIONS

Air flow, elapsed time, total air volume, and plutonium concentrations are calculated using field data collected by the EMATs.

5.1 AIR FLOW

Air flow is determined from the "Look-up Table" provided with each sampler. The data in the "Look-up Table" is verified by performing a calibration on the air sampler with an orifice that has been certified against a National Institute of Standards and Technology (NIST) primary standard.

The Stagnation Pressure Ratio (SPR) and the ambient temperature are needed to use the "Look-up Table". The SPR is determined using the stagnation pressure drop (Δpstg) of the sampler. This is determined by attaching a water manometer to the pressure tap on the side of the sampler and reading the inches of water column displacement. The manometer reading must then be converted from inches of water to inches of mercury (Hg) using the following equation:

$$\Delta Pstg \text{ inches Hg} = \Delta Pstg \text{ inches } H_2O/13.6$$

The equation used to calculate the SPR is as follows:

$$SPR = P1/Pa$$

where:

- $P1$ = Stagnation Pressure, in. Hg
  - $P1 = Pa - \Delta Pstg$
- Pa = Annual Average Ambient Barometric Pressure, in. Hg
- $\Delta Pstg$ = Stagnation Pressure Drop, in. Hg

Air flow data determined with the "Look-up Table" is in actual cubic meters per minute (ACMM).

Before using the air flow data, ACMM taken from the table must be converted to standard conditions. The following equation is used for the conversion:

$$Qstd = Qa(Pa/Pstd)(Tstd/Ta)$$

where:

- $Qstd$ = Standard Volume Flow Rate, Std m^3/min
- Qa = Actual Volume Flow Rate, Actual m^3/min
- Pa = Annual Average Ambient Barometric Pressure,in. Hg
- $Pstd$ = EPA Standard Barometric Pressure, 29.92 in. Hg
- $Tstd$ = EPA Standard Temperature, 537 R
- Ta = Ambient Temperature, R (R = °F + 460)

5.2 ELAPSED TIME

The elapsed time is calculated from the hour meter data on the log sheets. The following equation is used:

$$t = [(t_f - t_i) + (t_f - t_i)] * 60$$

where:

t = Sampling Time, Minutes

t_f = Final Hour Meter Reading When Filter is Removed

t_i = Initial Hour Meter Reading When Filter is Installed

60 = Number of Minutes Per Hour

$(t_f - t_i)$ = Elapsed Sampling Time for Each Filter within the Sampling Period, Hours

5.3 TOTAL AIR VOLUME

The total standard volume (Vstd) of air pulled through the sampling filter is calculated with the following equation:

$$Vstd = Qstd * t$$

where:

Vstd = Total Air Sampled in Standard Volume Units, Std m^3

Qstd = Standard Volume Flow Rate, Std m^3/min

t = Sampling Time, Minutes

5.4 PLUTONIUM CONCENTRATION

The plutonium concentration reported in the monthly environmental monitoring report is presented in picocuries per cubic meter (pCi/m^3).

The lab results from the sample filter analysis are received in units of Disintegrations Per Minute (DPM). If more than one filter composite is analyzed, the DPMs for each composite are added together. The DPM is then converted to total picocuries (pCi) by dividing the DPM value by 2.22 (2.22 is a conversion factor to covert from DPM to pCi).

Total Pci = DPM/2.22

The final step is to calculate total picocuries per cubic meters (pCi/m^3). This is done using the following equation:

Total pCi/m^3 = Total pCi / Vstd

where:

Vstd = Total Air Sampled in Standard Volume Units, Std m^3

RESTORATION PROJECTS RADIOACTIVE AMBIENT AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

EG&G ROCKY FLATS PLANT	**Manual:**	**5-21000-OPS**
EMD MANUAL OPERATION SOP	**Procedure No.:**	**AP.16, Rev. 0**
	Page:	**1 of 11**
	Effective Date:	**October 1, 1991**
Category 2	**Organization:**	**Environmental Management**

This is a CONTROLLED DOCUMENT
EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT
This is a RED Stamp

TITLE:
RESTORATION PROJECTS RADIOACTIVE AMBIENT AIR PARTICULATE SAMPLING HIGH VOLUME METHOD

Approved By:

Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

This procedure will establish and document the requirements and responsibilities for non-routine radioactive ambient air monitoring at the Operable Units (OU) at the Rocky Flats Plant (RFP).

This document outlines the required steps for proper field operation of the particulate samplers. Included are descriptions of air sampling equipment, sampler operation, filter exchange, filter preparation, and sample documentation.

The purpose of the monitoring program is to quantify the concentrations and species of radioactive ambient particulates present during characterization and restoration activities at the investigation sites. Data may be used to address baseline risk assessment and environmental concerns. It's imperative that data is of high quality and totally defensible through proper record keeping and adherence to accepted methodologies, regulations, and guidelines.

3.0 RESPONSIBILITIES AND PROGRAM SUPPORT

Air sampling is performed pursuant to an Inter-Agency Agreement (IAG) among the Department of Energy (DOE), Colorado Department of Health (CDH), and the U.S. Environmental Protection Agency (EPA). These agreements stem from health and safety concerns for employees working on the project as well as the general public.

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Program manager is responsible to insure all radioactive particulate air sampling is performed in compliance with approved procedure and specific OU work plan. The program manager is responsible for completion and coordination of the following items:

1) Operation and maintenance of the sampling network including supervision of the field sampling staff.

   a) Schedule Site Checks,
   b) Schedule Preventive Maintenance Activities,
   c) Schedule Sample Collection,
   d) Schedule Laboratory Sample Compositing,
   e) Schedule Sampler Calibration,
   f) Coordination of Maintenance Work Requests for Repair of Inoperable Samplers.

2) Preparation of a monthly ambient air report for submission to the OU project manager.

3.2 FIELD PERSONNEL DUTIES

The Environmental Management Division (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform the field sampling. The EMATs principal responsibility is to record data and change filters on each air monitoring sampler. This is a two-step procedure and is completed on a weekly basis. Initially, a filter is installed and the necessary data is recorded for all samplers. A week after the filter is installed, the data is again recorded. The filter is then removed and submitted to the Radiological Health Laboratory for analysis. A new filter is installed and the necessary data is again recorded.

3.3 MAINTENANCE SUPPORT

The EMATs inspect the samplers daily to insure the sampler is operational. Since the sampler operates continuously, the sampler blower motor is replaced on a weekly basis to minimize sampler down-time from motor or brush failure. Other maintenance problems and issues require submission of RFP work request forms. Maintenance support is provided by Building 334 maintenance personnel. All maintenance is performed in accordance with procedure No.AP.12, Maintenance Procedure for RFP TSP HiVol Air Sampler.

3.4 AIR SAMPLER CALIBRATION

The Metrology Standards Laboratory performs a multipoint calibration on all new samplers to characterize the flow capabilities of each orifice. All calibrations are executed using a transfer standard traceable to the National Institute of Standards and Technology (NIST). Subsequent calibrations consist of a single point flow check and are performed on a quarterly basis. The above calibration equipment and schedule are used for volumetrically flow controlled samplers. This is used until it is established that the calibration "Look Up Table" provided with each sampler is within three to four percent of the calibration values obtained using the certified transfer standard. Once this is determined, the "Look Up Table" is used to determine flow rate data. Mass flow controlled samplers require quarterly calibration and adjustment in accordance with procedures contained in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.2, Reference Method for the Determination of Suspended Particulates in the Atmosphere (High Volume Method) EPA-600/4-77-027a.

3.5 LABORATORY SUPPORT

The Radiological Health Laboratory's (RHL) central receiving area in Building 123 accepts the ambient air samples from the EMATs. An exchange of custody form is signed upon RHL receipt of filter samples (See Form FO.14H at the back of this document). RHL also performs the filter analysis. The samples are analyzed in accordance with procedure HEA 0001-01: Analysis of Plutonium on Variable Composite and High Dust Load Glass Fibre Filters and procedure HEA 0019-01: Analysis of Americium on Variable Composite and High Dust Load Glass Fiber Filters. Quality checks performed by the lab include the use of duplicates, spikes, blanks, internal standards, and calibration standards. A plutonium disintegration perminute (dpm) value is provided to the air program manager.

4.0 REFERENCES

4.1 SOURCE REFERENCES

CFR Title 40, Part 50, Appendix B. Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High Volume Method).

U.S. Environmental Protection Agency, 1976. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II Ambient Air Specific Methods. EPA-600/4-77-027a.

Colorado Air Quality Control Commission's (AQCC) Regulation 1, Section III, Fugitive Particulates.

Wedding and Associates, Inc, Operating Manual, The Wedding and Associates TSP Critical Flow High Volume Sampler.

4.2 INTERNAL REFERENCES

- SOP AP.12, Maintenance Procedure for RFP TSP HiVol Air Sampler.

5.0 OPERATIONAL PROCEDURES

The operational status of all particulate air samplers is checked daily. Performance data is collected by the EMAT weekly during the filter exchange process. Filters are changed on Monday of each week. Sampler motor replacement is performed weekly as a preventative maintenance effort.

The activities required during the daily inspection are:

- Open the front panel door and verify the sampler is operating:
- Check the motor voltage control unit for the proper setting:
- Check the voltage control unit for the proper setting of 110 volts AC and adjust if necessary:
- Connect a manometer to the pressure tap on the side of the sampler and record the pressure differential for each sampler and the temperature at each location:
- Record and report any unusual activities or activities which may generate significant dust loading to the air program manager.

The tasks required of the EMAT during the weekly filter change are:

- Open the sampler access door;
- Record the pressure differential, elapsed timer reading and ambient temperature;
- Open the sampler lid;
- Remove the used filter and place it in its designated envelope;
- Install a clean filter, record the pressure differential, elapsed timer reading, and temperature;
- Close and lock the lid of the sampler;
- Record any unusual activities that may effect sample validity.

5.1 INSPECTION/FILTER EXCHANGE ROUTE PROCEDURE

The EMAT picks up a government vehicle at Building T130B parking area and returns it to this location when not in use.

- The EMAT picks up the following supplies and equipment from the Ambient Air Monitoring station prior to daily inspections and/or filter exchange days:

  - Daily Inspections
    Log Sheets,
    36-inch U-tube Manometer,
    Thermometer,

Pen or Pencil.

- Filter Exchange Days

Log Sheets,

36-inch U-tube Manometer,

Thermometer,

Protective/Identification Envelopes,

Unused Filters,

Pen or Pencil.

5.2 FILTER CHANGE

Filters are changed on Monday of each week.

- The EMAT is issued a key that unlocks the covers of all samplers. Upon arrival, unlock the cover and open the top of the shelter.

- Secure the cover on the hinged side of the sampler cover by hooking the lock through the eye of the hasp.

- Record the following information on the Ambient Air Monitoring Log sheets for each sampler (Form AP.16A):

  - Employee Initials,
  - Physical Condition of Sampler (Comments Section),
  - Date,
  - Pressure Differential (Record under Flow Reading),

- Hour Meter Reading,
- Temperature at Sampler Location,
- Comments (i.e., Weather Conditions, Construction Activities in the Area).

5.2.1 Changing the Filter

The following procedure details the steps to be followed when removing and installing filters on the sampler.

1) Open the sampler lid and secure in place.

2) Remove the four wing nuts that hold the filter cassette in place.

3) Remove the filter cassette from the sampler and transport to the field vehicle.

4) Remove the used filter from the cassette by unscrewing the wing nuts and lifting the top plate off the cassette, exposing the filter.

5) Fold the filter with the exposed side inward.

6) Place the folded filter in a pre-labeled envelope.

NOTE: The envelope should be marked with the sampler identification number, the initial flow rate, final flow rate, date, and elapsed time readings (initial and final).

7) Take a clean filter from the box and place it on the mesh screen of the filter cassette.

8) Replace the top part of the filter cassette carefully to avoid damage or movement of the filter.

9) Make sure that all four sides of the filter are covered by the top plate of the cassette and replace the wing nuts to secure the filter in place.

10) Return the filter cassette to the sampler and set it in place. Screw the wing nuts on to secure the filter cassette in place (DO NOT OVER TIGHTEN WING NUTS).

11) Record on a new log sheet the following:

    a) Date,
    b) Pressure Differential,
    c) Temperature at the Sampler Location,
    d) Hour Meter Reading.

12) Release the lid by removing the lock from the hasp on the back side of the shelter and close the lid.

13) Lock the lid and make sure the cap for the pressure differential tap is re-installed.

6.0 EQUIPMENT DESCRIPTION

6.1 SAMPLER

The ambient air samplers currently in use on the OU projects are volumetrically flow controlled Total Suspend Particulate Samplers (TSP). The high volume ambient air samplers are operated on a continuous basis. Ambient air is pulled into the sampler shelter and through a filter, trapping particulates for subsequent analyses. The elapsed time indicator is accurate to better than +/- 0.1 minutes.

6.2 PRESSURE DIFFERENTIAL INDICATOR

The pressure differential is monitored using a Dwyer 36-inch U-tube oil manometer.

6.3 FILTERS

The filter media used is an 8 X 10-inch glass fiber filter manufactured by Schleicher & Schuell (Model # 34). These filters are 99.9 percent efficient for particle sizes down to 0.3 microns with air pressure drops typical of ambient air sampling.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM FO.14H

HEALTH/ENVIRONMENT LABORATORY
ENVIRONMENTAL SAMPLE CHAIN OF CUSTODY RECORD (AIR SAMPLES)

Project Description (No.)	Project Responsibility
Sampler(s): (Signature)	

Sample Type	Customer Identification	H/E Lab Number (By CRL)	Comp.	GRAB	Time (Mill.)	Date	Sample Location	Dis. Spl. Volume (ml)	Aligust Volume/Run No.			Plutonium (PHA)	Americium (PHA)	Uranium (PHA)	Uranium-Phosphorim	Tritium				Remarks

Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by: (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (Signature)
Relinquished by (Signature)	Date/Time	Received for: by (Signature)	Relinquished by: (Signature)	Date/Time	Received for: by (signature)

Custody Record Page ______ of ______ Pages	Sample Batch No. ______	Reagent Nos. ______

RF-47151 (4/87)

RADIOACTIVE AMBIENT AIR MONITORING PROGRAM
ELAPSED TIME AND FLOW RATE LOG SHEET
OPERABLE UNITS AND SPECIAL

Document Control Number ____________________

	Initial			Inspection			Final Reading		
ID. No.	Date	Meter Reading	Flow CMM	Date	Meter Reading	Flow CMM	Date	Meter Reading	Flow CMM
S-81A									
S-81B									
S-81C									
S-81D									
S-82									
S-83									

Initials: _____ Initials: _____ Initials: _____

Comments:

EG&G ROCKY FLATS PLANT	**Manual:**	**5-21000-OPS**
EMD MANUAL OPERATION SOP	**Procedure No.:**	**AP.17, Rev. 0**
	Page:	**1 of 10**
	Effective Date:	**October 1, 1991**
Category 2	**Organization:**	**Environmental Management**

TITLE:
SAMPLING PROCEDURE, VOLATILE ORGANIC COMPOUNDS METHOD TO-14

Approved By: Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

This document outlines the required steps for proper field operation of the volatile organic compound (VOC) Summa passivated canister sampler. Sampling is designed for the measurement of VOCs in ambient air and is based on the collection of whole air samples in passivated stainless steel canisters.

U.S. Environmental Protection Agency Method TO-14 has provisions for subatmospheric and pressurized canister sampling.

Although this procedure will not address laboratory functions or analytical procedures, some understanding of these functions is desirable. This method (TO-14) can be applied to sampling and analysis of not only VOCs, but also some selected semivolatile organic compounds (SVOC). The term SVOC is used to describe organic compounds that are too volatile to be collected by filteration air sampling but not volatile enough for thermal desorption from solid sorbents. The analytical schema for Method TO-14 pertains to use of a high resolution gas chromatograph (GC) linked to one or more GC detectors. The choice of detector is related to the target list of analytes and the required sensitivity. This choice needs to be determined based on the known compounds in a particular area or Operable Unit, and will often be made as a result of VOC screening.

3.0 RESPONSIBILITIES AND PROGRAM SUPPORT

Air sampling at the operable units (OU) at Rock Flats Plant (RFP) is performed pursuant to an Inter-Agency Agreement (IAG) among the Department of Energy (DOE), Colorado Department of Health (CDH), and the U.S. Environmental Protection Agency (EPA). These agreements stem from health and safety concerns for employees working on the project as well as the general public.

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Program manager is responsible to insure all sampling is performed in compliance with approved procedure and specific OU work plan. The program manager is responsible for completion and coordination of the following items:

1) Operation and maintenance of the sampling network including supervision of the field sampling staff.

    a) Schedule Site Checks,
    b) Schedule Preventive Maintenance Activities,
    c) Schedule Sample Collection,
    d) Schedule Sample Analysis,
    e) Schedule Sampler Calibration.

2) Coordination of maintenance work requests for repair of inoperable samplers.

3) Preparation of a monthly ambient air report for submission to the OU project manager, when applicable.

4) Data analysis and preparation of data reports for non OU sampling activities when applicable.

5) Procurement of samplers, supplies, expendables, and spare parts inventory.

3.2 FIELD PERSONNEL DUTIES

The Environmental Management Department (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform the field sampling. The EMATs principal responsibility is to record data and change canisters in the samplers. EMATs are also responsible for the compilation of chain of custody documents, sample logs, and preparing samples for delivery to the laboratory.

3.3 MAINTENANCE SUPPORT

The EMATs inspect the samplers to insure the samplers are operational. Other maintenance problems and issues require submission of RFP work request forms. Maintenance support is provided by Building 334 maintenance personnel.

3.4 AIR SAMPLER CALIBRATION

Calibration of the samplers is performed by the EMD Instrument Engineer and Air Quality Specialist.

4.0 REFERENCES

4.1 SOURCE REFERENCES

U.S. Environmental Protection Agency, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA 600/4-89-017, June 1988.

U.S. Environmental Protection Agency. Air/Superfund National Technical Guidance Study Series, Volume IV,Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis, EPA-450/1-89-004, July 1989.

U.S. Environmental Protection Agency. Technical Assistance Document for Sampling and Analysis of Toxic Organic Compounds in Ambient Air, EPA-600/4-84-027, June 1983.

5.0 OPERATIONAL PROCEDURES

The operational status of all VOC air samplers is checked during each sampling period. Performance data is collected by the EMAT when preparing the sampler for operation and at the end of the sample period.

5.1 SAMPLING PROCEDURE

- To avoid sample problems and interferences the sample canister is cleaned and tested at the laboratory according to procedures contained in EPA Method TO-14.

- This procedure describes the use of subatmospheric canister sampling. Samples are collected in six-liter, SUMMA passivated stainless steel canisters. The evacuated canister draws the ambient sample into itself at a fixed flow rate controlled by an electronic mass flow controller.

- The EMAT will pick up the government vehicle at the Building T130B parking area and return it to this location when not in use.

- The following supplies and equipment are needed and are available at the Ambient Air Monitoring station:

  - Log Sheets,
  - Electronic Mass Flow Meter,
  - Thermometer,
  - Aneroid Barometer,
  - Pen or Pencil,
  - Sampling Canisters.

5.1.1 Sampler Installation

The sampler is enclosed in a weather tight-case and can be easily sited. The only requirement is the need for AC power. The sample probe should be as close as possible to the breathing zone, typically five to six-feet above ground level.

5.1.2 Sample Canister Installation

The sample canister should be cleaned and tested according to procedures contained in EPA Method TO-14. The cleaning and testing is conducted at the laboratory prior to shipment of canisters to RFP.

1) The canister is installed no more than two days prior to the sampling schedule day.

2) Turn the timer number one on to allow the mass flow controller to warm up for at least fifteen minutes.

3) Connect an evacuated "practice" canister to the sampling port on the sampler using one eighth inch stainless steel tubing and Swagelock fittings. The canister valve is left in the closed position. Tighten the fittings snugly with a wrench. If the sampler is equipped with a second sampling port be sure it is plugged with a Swagelock plug. This canister will be used to draw air through the system during adjustment of the mass flow controller.

4) Turn on timer number two. This will stop the flow of air through the flow controller. Set the flow controller switch to "READ". Allow the reading on the flow controller to stabilize and record as the zero flow reading on the field data sheet (Form AP.17A).

5) Attach a mass flow meter to the inlet line of the manifold in front of the particulate filter.

6) Open the canister valve. Allow the readings on the mass flow controller of the sampler and the mass flow meter to stabilize. Read and record these values. If they differ by more than ten percent check the sampler for leaks. If the flow discrepancy can not be resolved the sampler should be removed from service and the mass flow controller recalibrated.

7) After two minutes, the desired canister flow rate is adjusted. Adjustments should be made with reference to the mass flow meter.

Be sure to add or subtract the zero offset established in step 4. The final flow should be adjusted to 3.5 cm^3/min for a twenty four hour sample and 7.0 cm^3/min for a twelve hour sample. Record the final value under "Canister Flow Rate" on the field data sheet.

8) Turn the sampler off. Wait 30-seconds and turn the sampler on. Verify the flow set in Step 7 has not changed. Reset the elapse time meter to zero and close the valve on the canister.

9) Turn off the sampler and timers. Loosen the Swagelock fitting connecting the canister to the sampler. Remove the "practice" canister.

10) Connect a clean evacuated canister to the one eighth inch stainless steel tube. Check to see both timers are turned off. Open the canister valve, and the vacuum pressure gauge valve. Record the pressure/vacuum registered on the pressure gauge.

11) Set the electronic timer to begin and stop the sampling at the appreciate time. Set the minimum maximum thermometer. Record the ambient temperature and pressure on the data sheet.

12) Before leaving the site verify the following:

    a) Canister is connected properly and the unused connection is capped.
    b) The canister valve is opened.
    c) Timers are properly set for the desired sample period.
    d) Timers are set to the "Auto" position.
    e) Timers are set to the current time and day.
    f) The elapsed time meter is set to 0.

5.1.3 Post Sampling, Canister Removal

Before removing the canister, record the maximum, minimum, current interior temperature and ambient temperature on the field data sheet. Record the current flow controller reading.

1) Briefly open and close the pressure/vacuum gauge valve and record the vacuum pressure on the field data sheet. The pressure should be close to the desired pressure. For subatmospheric sampling the pressure should be about 7 kPa less than ambient. If the sample is at ambient the sample may be suspect. This information should be recorded on the field data sheet.

2) Close the canister valve. Disconnect the sample line from the canister and remove the canister from the sampler. Record the time of day and elapsed time reading on the field data sheet.

3) Install the "practice canister" and the mass flow meter on the sampler. Open the canister valve. Allow the readings on the mass flow controller of the sampler and the mass flow meter to stabilize. Read and record these values as the "final flow rate" on the field data sheet.

4) Attach an identification tag to the canister. Record the canister serial number, sample number, location of the sampling site, and sample date.

5) Take the canister to the ambient air monitoring station. Verify the information on the data sheet is correct and the information on the canister identification tag match. Transcribe all data into the VOC sample logbook.

6) Complete the chain of custody for each sample to be shipped to the laboratory (Form AP.17B). Pack the canisters in a shipping box. Make copies of the chain of custody forms and file.

7) Transcribe all of the above data to the sample logbook.

8) Deliver the cooler to an overnight delivery company for shipment. The chain of custody forms should be placed in the shipping pouch with the air bill. Make copies of the shipping documents, be sure the shipping numbers are legible.

CANISTER SAMPLING FIELD DATA SHEET

A. General Information

Site Location: ______________________

Site Address: ______________________

____

____

Sampling Date: ______________________

Shipping Date: ______________________

Canister Serial No.: ______________________

Sampler ID: ______________________

Operator: ______________________

Canister Leak Check Date: ______________________

B. Sampling Information

Temperature

	Interior	Ambient	Maximum	Minimum
Start				
Stop				

Pressure

Canister Pressure	

Sampling Times

	Local Time	Elapsed Time Meter Reading
Start		
Stop		

Flow Rates

Manifold Flow Rate	Canister Flow Rate	Flow Controller Readout

Sampling System Certification Date: ______________________

Quarterly Recertification Date: ______________________

C. Laboratory Information

Date Received: ______________________

Received By: ______________________

Initial Pressure: ______________________

Final Pressure: ______________________

Dilution Factor: ______________________

Analysis

GC-FID-ECD Date: ______________________

GC-MSD-SCAN Date: ______________________

GC-MSD-SIM Date: ______________________

Results*: ______________________

____

GC-FID-ECD: ______________________

GC-MSD-SCAN: ______________________

GC-MSD-SIM: ______________________

____

Signature/Title

* Attach Data Sheets

VOC CHAIN OF CUSTODY FORM

Project Name: ______________________ Project No.: ______________

Sample Number	Date Collected	Sample Type							STD Volume Collected	Analyses to be Performed					
		TSP		RS-1 Filter	RUF			Asbestos Filter		Metals	Hg	Asb	VOC	SVOC	As

Relinquished by (Signature)	Date/Time	Received By (Signature)	Relinquished by (Signature)	Date/Time	Received by: (Signature)
Relinquished by (Signature)	Date/Time	Received by Laboratory by: (Signature)	Date/Time	Sample Split Date ______ Sample Extraction Date ______	
Relinquished by (Signature)	Date/Time	Received by Laboratory by: (Signature)	Date/Time	Sample Analysis Date ______ Air Bill Number ______	

SAMPLING FOR ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN AMBIENT AIR (SVOC)

EG&G ROCKY FLATS PLANT	**Manual:** 5-21000-OPS
EMD MANUAL OPERATION SOP	**Procedure No.:** AP.18, Rev. 0
	Page: 1 of 13
Category	**Effective Date:** October 1, 1991
	Organization: Environmental Management

Title:
SAMPLING FOR ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN AMBIENT AIR (SVOC)

Approved By:
Ralph Porter 10/11/91
(Name of Approver) (Date)

1.0 TABLE OF CONTENTS

2.0 PURPOSE AND SCOPE

This document outlines the required steps for proper field operation of the polyurethane foam (PUF) high volume air sampler. Sampling is designed for the measurement of organochlorine pesticides and polychlorinated biphenyls (PCB) in ambient air.

Field sampling of semivolatile contaminants will be measured by methodology based on guidelines outlined in U.S. Environmental Protection Agency (EPA) Method TO-4.

3.0 RESPONSIBILITIES AND PROGRAM SUPPORT

Air sampling at the operable units (OU) at Rocky Flats Plant (RFP) is performed pursuant to an interagency agreement (IAG) among the Department of Energy (DOE), Colorado Department of Health (CDH), and the U.S. Environmental Protection Agency (EPA). These agreements stem from health and safety concerns for employees working on the project as well as the general public.

3.1 PROGRAM MANAGER RESPONSIBILITIES

The Air Program manager is responsible to insure all sampling is performed in compliance with approved procedure and specific OU work plan. The program manager is responsible for completion and coordination of the following items:

1) Operation and maintenance of the sampling network including supervision of the field sampling staff.

   a) Schedule Site Checks,
   b) Schedule Preventive Maintenance Activities,

c) Schedule Sample Collection,

d) Schedule Sample Analysis,

e) Schedule Sampler Calibration.

2) Coordination of maintenance work requests for repair of inoperable samplers.

3) Preparation of a monthly ambient air report for submission to the OU project manager, when applicable.

4) Data analysis and preparation of data reports for non OU sampling activities, when applicable.

5) Procurement of samplers, supplies, expendables, and spare parts inventory.

3.2 FIELD PERSONNEL DUTIES

The Environmental Management Department (EMD) uses Environmental Monitoring and Assessment Technologists (EMAT) to perform the field sampling. The EMATs principal responsibility is to record data and change filters and foam plugs on each PUF sampler. EMATs are also responsible for the compilation of chain-of-custody documents, sample logs, and preparation of samples for delivery to the laboratory.

3.3 MAINTENANCE SUPPORT

The EMATs inspect the samplers to insure the sampler is operational. Other maintenance problems and issues require submission of RFP work request forms. Maintenance support is provided by Building 334 maintenance personnel. All maintenance is performed in accordance with procedure No. AP.12, Maintenance Procedure for RFP TSP HiVol Air Sampler.

3.4 AIR SAMPLER CALIBRATION

The Metrology Standards Laboratory performs a multipoint calibration on all new samplers to characterize the flow capabilities. All calibrations are executed using a transfer standard traceable to the National Institute of Standards and Technology (NIST). See Section 4.2 of this procedure for specific calibration procedures.

4.0 REFERENCES

4.1 SOURCE REFERENCES

U.S. Environmental Protection Agency, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA 600/4-89-017, June 1988.

U.S. Environmental Protection Agency. Air/Superfund National Technical Guidance Study Series, Volume IV,Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis, EPA-450/1-89-004, July 1989.

U.S. Environmental Protection Agency. Technical Assistance Document for Sampling and Analysis of Toxic Organic Compounds in Ambient Air, EPA-600/4-84-027, June 1983.

Anderson Samplers, Inc., Operating Instructions Model PS-1 Polyurethane Foam (PUF) Sampler.

4.2 INTERNAL REFERENCES

- SOP AP.12, Maintenance Procedure for RFP TSP HiVol Air Sampler.

5.0 OPERATIONAL PROCEDURES

The operational status of all PUF air samplers is checked during each sampling period. Performance data is collected by EMAT when preparing the sampler for operation and at the end of the sample period.

5.1 SAMPLING PROCEDURE

- To avoid sample problems and interferences, the sample cartridge is not allowed to remain in the sampler after the sampling period. For this reason, remote or delayed sampling using the sampler's timer is not performed. The EMAT will begin the sample at the time of the cartridge installation. The sampler is checked once during the sample run. The Magnehlic reading, elapsed time reading, temperature, and barometric pressure is recorded at this time. The sample will end the following day (approximately 24-hours later). At this time, the EMAT removes the sample cartridge and again records the pertinent information. Flow rate (Magnehlic reading) and elapsed time needed to calculate volume are of much greater significance than the time of day the sample is started and ended.

- The EMAT picks up a government vehicle at Building T130B parking area and returns it to this location when not in use.

- The following supplies and equipment are needed and are available at the Ambient Air Monitoring station:

- Log Sheets,
- 8-inch U-tube Manometer,
- Thermometer,
- Aneroid Barometer,
- Pen or Pencil,
- Sampling Cartridge and Glass Fiber Filter,
- Sample Collection Cooler.

5.1.1 Sample Cartridge Installation

To minimize the handling of samples in the field and reduce the potential for cross-contamination, the entire sample cartridge is prepared at the laboratory. This includes all cleaning of sample cartridges, installation of the PUF absorbent, and the particulate filter. The following steps should be followed in the order given when installing a sample cartridge:

1) Open the sampler lid and secure in place.

2) Remove the sampling cartridge and filter from the sealed transport container with clean gloved hands. Install the sampling cartridge and glass fiber filter in the sampler. The sampling head fits tightly in the sealing mechanism. Be sure it's seated before locking into place.

3) Release the three swing-bolts on the filter holder and remove the aluminium filter shipment cover. Tighten the swing bolts.

4) Record the following information on the field sampling data sheet (Form AP.18A):

a) Project Number,

b) Filter Number and PUF Cartridge Number,

c) Sample Date,

d) Sampler ID and Serial Number.

5) Check the zero on the Magnehelic gauge. Turn on the sampler and allow it to operate for ten minutes. This allows it to reach full operating temperature. With the ball valve completely open, adjust the voltage control variator to provide a flow of 230 liters per minute based on the latest calibration. Refer to the field calibration curve for each sampler to determine proper Magnehelic reading to achieve the desired flow. Record the following data on the field sampling data sheet:

a) Ambient Temperature and Barometric Pressure,

b) Sample Start Time and Elapsed Time Indicator Reading,

c) Magnehelic Reading.

6) Close and latch the sampler door and lid.

7) Transcribe all information from the field data sheet into the sampling site log. Note any conditions which may impact the sampling for this period (Dust Storms, Construction Activity, etc).

5.1.2 Operational Check Procedure

The EMATs will check the samplers a minimum of once during the sample run. Record the following data on the field data sheet:

1) Time and Date of the Operational Sample Check,
2) Ambient Barometric Pressure and Temperature,
3) Magnehlic and Elapsed Time Readings from the Sampler,
4) Transcribe the Above Data into the Sample Logbook.

5.1.3 Sample Cartridge Removal

This procedure details the removal process for the sample cartridge.

1) Prior to turning off the sampler record the following data on the field data sheet:

   a) Ambient Temperature and Pressure,
   b) Magnehlic Gauge Reading,
   c) Time of Sample Removal,
   d) Elapsed Time Meter Reading.

2) Turn off power to the sampler.

3) Open the lid to the sampler and secure.

4) Release the three swing-bolts on the filter holder and remove the hold-down ring. Place a clean unused filter over the exposed filter. This will prevent any of the

particulate from being dislodged and lost during shipment. Replace the hold down ring, and place the aluminum filter cover over the sample filter. Tighten the three swing-bolts.

5) Remove the sample cartridge from the sampler. Place the sample cartridge in a large sealable plastic bag. Put the bag in the sample collection cooler for transport back to the ambient monitoring station.

6) Close the sampler lid and door.

5.1.4 Sample Preparation for Shipment to Laboratory

This procedure describes the steps needed to prepare the sample for shipment to the offsite laboratory for analysis. The following activity needs to be performed in a clean temperature controlled environment. To minimize sample handling as much as possible, the complete sample cartridge is delivered to the laboratory for disassembly and sample analysis. The procedure should be followed in the order presented.

1) Thoroughly wash and dry hands.

2) Prepare a clean work area on the bench. Cover the bench top with clean butchers paper and change as frequently as required.

3) Open the sample collection cooler and remove one sample cartridge. Close the cooler.

4) Put on a clean pair of polyester laboratory gloves.

5) Remove the sample cartridge from the plastic bag. Check to assure all paper work is properly completed including sample numbers. Place a rubber stopper in the lower canister to seal off the PUF cartridge for shipment. Put the sample cartridge back in the plastic shipping bag and seal.

6) Place the sealed bag and sample cartridge in a cooler for shipment to the laboratory. When all samples are checked and ready for shipment, pack the cooler with frozen "blue ice." The cooler should maintain a temperature of about 20 °C during shipment to the laboratory. Upon reaching the laboratory, the samples are stored at 4°C.

7) Complete the SVOC chain-of-custody for each sample to be shipped to the laboratory (Form AP.18B). Seal the cooler with evidence tape. Make copies of the chain-of-custody forms and file.

8) Transcribe all of the above data to the sample logbook.

9) Deliver the cooler to an overnight delivery company for shipment. The chain-of-custody forms should be placed in the shipping pouch with the air-bill. Make copies of the shipping documents and be sure the shipping numbers are legible.

5.2 PUF SAMPLER CALIBRATION

- The calibration technician should read these procedures thoroughly and become familiar with the sampler prior to beginning calibration.

- The following equipment and materials are required for calibration of the samplers:

  - Calibration Orifice Transfer Standard with NIST Traceability,
  - Water or Oil Manometer with a 0 to 8-inch Range for Orifice Pressure Measurements,
  - Thermometer with a 0° to 50°C Range, Accurate to ±1°C,
  - Aneroid Barometer with a Range of 500 to 800 mm Hg and Accurate to ±5 mm Hg,
  - Calibration Data Sheets.

NOTE: Do not calibrate the sampler during windy conditions. The calibration will be less precise due to pressure variations associated with wind fluctuations.

- The airflow through the sampling system is monitored by a venturi/Magnehlic assembly. A multipoint calibration will be performed on the sampler once per calendar quarter. The following procedure should be followed in the order listed to perform the calibration. Refer to the manufactures operator manual for additional information.

Note: The calibration must be performed in the field. Calibration must conform to U.S. EPA, High Volume Sampling Method (8).

1) Install a "dummy" sampling module (without a foam slug or filter paper in the

sampling module). However, the empty glass PUF cartridge must be installed to insure a good seal through the module.

2) Install the orifice calibration unit on top of the four-inch filter holder.

3) Inspect the manometer tubing for crimps or cracks. Open the manometer valves and gently blow through the tubing; watch for the fluid in the manometer flow.

4) Adjust the manometers' sliding scales to position the zero lines at the bottom of the meniscuses. Connect the manometer to the calibrator.

5) Open the ball valve fully. The ball valve is located behind the front panel door next to the Magnehelic gauge.

6) Turn on the sampler by tripping the manual switch on the timer. Allow the sampler to operate for 10 minutes. This allows it to reach full operating temperature.

7) On the calibration data sheet, record the ambient temperature and barometric pressure at the site. (Form AP.18C).

8) Adjust the voltage control screw on the voltage variator to obtain a reading of 70-inches on the Magnehelic gauge. Check the manometer zero before running each calibration point.

9) With 70-inches on the Magnehlic as the first calibration point, record it and the manometer reading on the calibration data sheet.

10) Close the ball valve slightly to readjust the flow to a reading of 60-inches on the Magnehelic. Record this figure and the manometer reading on the data sheet.

11) Using the above procedure, adjust the ball valve for readings at 50, 40 and 30-inches on the Magnehelic and record the corresponding manometer readings on the calibration data sheet.

12) Using these two sets of readings, plot a curve on the data sheet. This curve will be used to determine the actual flow rate.

13) Remove the calibration orifice, manometer, and "dummy" sample cartridge from the sampler.

14) Install a calibration sampling cartridge. The absorbent and filters should be installed in this cartridge.

15) From the curve, determine the Magnehelic reading that corresponds to 230 liters per-minute. Open the ball valve fully and adjust the voltage variator to achieve the flow reading on the Magnehelic. Lock the voltage variator adjustment screw in this position with the locking nut.

16) Make two copies of the calibration data sheet and calibration curve. Give the original to the air programs manager. File one copy with the sampler file in the ambient monitoring station, and put one copy in the sampler log. This curve is used each time a sample is installed on the sampler to adjust the flow to the desired conditions.

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM AP.18A

SEMI-VOLATILE ORGANIC COMPOUND SAMPLING DATA FORM

Air Quality Monitoring

Operator: ______________________ Date: ______________

Checked By: ______________________ Date: ______________

Sample Station	Sampler Number	Sample Number	Filter Number	PUF Number	Clock Time			Sample Time			Magnehelic Reading		Average Flow Rate (dscl/min)	Barometric Pressure (in Hg)		Temperature		Humidity		Total Sample Volume (dsos)	Comments
					Start	Stop	Minutes Elapsed	Start	Stop	Minutes Elapsed	Start	Stop		Start	Stop	Start	Stop	Start	Stop		

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT

FORM AP.18B

SVOC CHAIN OF CUSTODY FORM

Project Name: ______________________________ Project No.: ______________

Sample Number	Date Collected	Sample Type							STD Volume Collected	Analyses to be Performed					
		TSP		RS-1 Filter	RUF			Asbestos Filter		Metals	Hg	Asb	VOC	SVOC	As

Relinquished by (Signature)	Date/Time	Received By (Signature)	Relinquished by (Signature)	Date/Time	Received by: (Signature)
Relinquished by (Signature)	Date/Time	Received by Laboratory by: (Signature)	Date/Time	Sample Split Date ______ Sample Extraction Date ______	
Relinquished by (Signature)	Date/Time	Received by Laboratory by: (Signature)	Date/Time	Sample Analysis Date ______ Air Bill Number ______	

CALIBRATION DATA SHEET
HIGH VOLUME AIR SAMPLER CALIBRATION

Unit No.: ______________

Date: ____________ By: ______________

Temp.: ____________ At. Press: _________

Remarks:

Indicated	True H_2O	Actual cfm